The
Electrical Review

VOL. CXIX SEPTEMBER 25, 1936. No. 3070.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.
Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.
Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).
The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.
SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

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Electro-deposition

THE lapse of time that may occur between the inception of an idea and its widespread application finds a good illustration in the history of electro-plating. Although Faraday stated the fundamental principles of electrolysis more than a hundred years ago, and electro-plating dynamos were built soon after the middle of the last century, and although the means of obtaining deposits of various kinds have long been known (chromium, for instance, for thirty years), it is only quite recently that the electro-deposition has come properly into its own.

Probably the most important influence in recent developments has been the improvement in methods of control of process, since a small departure from the most suitable conditions may cause material differences in results. This advance has involved such specialised knowledge as that relating to the pre-cleansing of articles, causes of unequal wear and of pitting, the effect of temperature of electrolyte and the measurement of deposit thickness.

Clearer understanding of these and other points has worked in the direction of improving quality of coating and speed of operation, so that to-day the industry may be said to rest upon secure foundations.

While electricity is, of course, the fundamental factor, most of these problems have depended for their solution on the chemist, and the discussions at the British Association meeting gave evidence of the multitudinous difficulties with which he has been faced. The exhibition staged at Blackpool by the Electrodepositors' Technical Society, however, provided an encouraging indication of how they have been overcome. Credit, too, must be given the physicist for a further notable contribution recently in the form of X-ray and electron-diffraction investigations of the interior structures of deposited metal.

Important as electro-deposition has proved to be in preserving from tarnishing and in adding lustre to articles of a decorative type, its scope in the engineering industry is likely to be no less far-reaching. Already the fabrication of metal tubing and sheets by this means and the building up of alloys is opening up a wide field.

In addition to reducing wastage from corrosion, electrolysis has been employed, to take one example, to deposit firmly adherent coatings to basis metals, thereby imparting a surface hardness that is capable of withstanding heavy stresses, the close limits within which the thickness of the deposit can be regulated enabling worn engineering parts to be built up exactly to requirements.

Rapid extension of existing applications may be expected in the near future, accompanied by a greater use of automatic control, and the range of metals deposited (including the rarest) will, no doubt. be considerably increased. These would of themselves provide a large field for intensified activity, but new developments in other industries and in the chemical and physical laboratories are likely to provide even more.

The past has shown that full advantage can be taken of the opportunities for the use of electricity in the chemical industries only if the closest co-operation can be maintained between the chemist and the engineer. Chemists have often to undertake responsibility for work that is strictly of an engineering character, but which is so specialised in its application as to fall outside normal engineering experience.

This alone would have been sufficient ground on which to base the formation of the Institution of Chemical Engineers, by which the two technical aspects are co-ordinated. The proposals made lately that chemical engineering (of which electro-deposition is but one aspect) should be made a degree subject seem likely to materialise, as they aim at filling a gap in the present educational curriculum.

The Next Convention

THE uncertainty which has existed since the close of the Edinburgh meeting in June regarding the place of the I.M.E.A. Annual Convention in 1937 has been removed by the official announcement this week that the choice has again fallen upon Brighton. It will open on Monday, May 31st, about three weeks after the Coronation of His Majesty on May 12th. With Mr. J. S. Forrest, city electrical engineer of Birmingham as president, that great city would, if it had been found desirable to follow the general rule, have been the appropriate Convention centre, but Brighton has always been a popular resort for the I.M.E.A. The very first Convention (in June, 1896), although it commenced in London, finished at Brighton, and the town had the distinction of providing the first president in the person of its borough electrical engineer, the late Mr. Arthur Wright of maximum-demand fame. The Association met again in Brighton on two subsequent occasions—in 1911 and 1925. Mr. J. Christie, who was then borough electrical engineer, presided at the 1911 gathering, and it is noteworthy that that year was a Coronation year, too, and moreover the year of the great Electrical Exhibition at Olympia. The president for the 1925 meeting was Mr. W. C. P. Tapper. Brighton should prove a greater attraction than ever next year, and it is a fitting place in which to celebrate the Association's long record of work.

The Contractors' Decision

EARLY this year, it will be recalled, there was some doubt as to whether the Electrical Contractors' Association would resume its annual conferences after the National Convention. The Council decided, however, to arrange a sort of semi-conference in London, but this met with no enthusiasm on the part of the members. It became clear that what members really wanted was a full-dress conference, and so the Folkestone meeting was organised. It proved to be the most successful of the series, which commenced with the Brighton Conference of 1926. Consequently the Council's decision this week to arrange a conference again next year was a foregone conclusion.

Dearer Lighting Fittings

RECENT advances in the cost of labour and material in the lighting fittings industry have necessitated action on the part of the manufacturers. About a month ago the Industrial and Commercial Section of the Electric Lighting Fittings Association announced its intention of reducing the discount on industrial lighting fittings to 25 per cent. Now the Decorative Section of the Association has notified the trade of a decision to increase by 5 per cent. the list prices of all non-industrial lighting fixtures and certain accessories. In making the announcement the Association states that the extra costs cannot be entirely absorbed by the manufacturers. The public should be able to bear the small proportional increase and there should be no reduction in business resulting from it.

Hydrogen-cooled Alternators

Two 60,000-kW alternators now being built by the American General Electric Co. for the Windsor generating station, owned jointly by the Ohio Power Co. and the West Penn Electric Co., are, it is stated in *Electrical Engineering*, the journal of the American Institute of Electrical Engineers, to be cooled by hydrogen. They will be the largest of this kind yet ordered, and are expected to be in service in two years' time. Their associated turbines are being designed for steam conditions of 1,250 lb. per sq. in. and 925 deg. F., and for exhausting into the existing steam range. The speed of the sets, 3,600 r.p.m., is, we believe, the highest for which generators of so large an output have yet been considered, and this is, presumably, connected with the method of cooling, which reduces windage and rotational losses and enables a larger output to be obtained for given physical dimensions. Hydrogen has a thermal conductivity many times that of the air and removes more heat for the same temperature drop. Although windage losses are said to be reduced by ten per cent. and the efficiency of the alternator improved by one per cent., the increased cost of construction would be prejudicial to the adoption of hydrogen cooling except in machines of large capacity working at a high load factor.

I.E.E. Arrangements

NEXT month sees the beginning of the winter round of meetings, dinners and other functions—business and social—prominent among which are the gatherings of the Institution of Electrical Engineers. The Institution has made its arrangements for the first half of the session, commencing with the delivery of his address by the new President, Mr. H. T. Young, on October 22nd. The papers for the ordinary meetings cover a varied field: in the first (November 5th) Messrs. T. E. Allibone, D. B. McKenzie and F. R. Perry deal with "The Effect of Impulse Voltages on Transformer Windings." On November 19th there will be a paper by Messrs. L. H. Norris, E. H. Jolly and F. O. Morrell on "Recent Developments in Telegraph Transmission and their Applications to the British Telegraph Services." Dr. P. Dunsheath, whose work in this direction is familiar to our readers, will deal with "The Continuous Extrusion of Lead Cable Sheaths" on December 3rd, and two switchgear papers will be presented on December 17th —"The Micro-gap Switch," by Professor W. M. Thornton, and "Restriking Voltage and its Import in Circuit-breaker Operation," by Messrs. H. Trencham and K. J. R. Wilkinson. A paper on "Lighting" is to be read by Mr. B. L. Goodlet on January 7th.

Patent Actions

IN his address as president of the Engineering Section of the British Association Professor W. Cramp made reference to the delay, difficulty and expense which an inventor encountered in pursuing patent actions. He considered that a drastic alteration of procedure was needed, quoting examples to illustrate the existing methods. As a consequence of this the Engineering Section Committee has adopted a resolution (which has been passed to the General Committee of the Association for action) recommending the setting-up of a committee to collect information on the matter and to frame possible improvements in procedure in technical cases. The principal object would be to devise means whereby issues can be more expeditiously examined in the light of technical knowledge and summarised for submission to the judge dealing with the case. There is no suggestion that the committee should consider alterations in the patent law.

Increasing the Scope

IT has been estimated that as regards the use of heat, industry is only 10 per cent. electrified. Looking at the prospects in the broadest way, can even that low proportion be justifiably claimed? The estimate is presumably based upon what is now done by other means, but there is more in the heating load than mere substitution of method plus an appreciable use of electricity for control and auxiliary purposes. An article on "Electric Heat in Industry" included in this issue suggests that beyond the better-known applications are innumerable possibilities which have not yet been exploited, but which offer opportunities to the ingenuity of those with a good knowledge of workshop conditions in various trades. How many "twigs," for instance, can be made to grow on the unclassified branch of the tree given by Mr. E. M. Ackery in his article which appeared in this journal on May 8th?

Gas News

IT is reported that a Joint Committee of the two Houses of Parliament has approved a new meter introduced by the South Metropolitan Gas Co. for registering by therms instead of by volume. The company has, however, failed to secure the approval of a very large number of its customers to its new system of charging for the said therms.

Electric Heat in Industry

By F. J. Campbell Allen, A.M.I.E.E., and S. A. Williams

Some unusual applications

THE scope of this article covers the applications of electricity to process work where heat is obtained either directly by heating elements and the like, or indirectly from steam raised in an electric boiler. The examples given cover a very large field both in this country and in America. For descriptions of some unusual jobs we are indebted to Mr. L. P. Hynes, of Philadelphia, but there is now no difficulty in obtaining similar equipment of British manufacture.

It will be appreciated that the type of installations described requires a careful study of the thermal and electrical problems involved and the correct application of the heat to the work. Cost is usually not the main consideration; it is results which count.

The typical installations described give a general idea of the type of work which can be carried out, but they should be regarded only as a brief summary of the field as new applications are always being found in all manner of industries which require heat.

[*Elec. Rev. photo*

The authors at work in their office (Comdr. Allen standing)

One of the illustrations is of a special machine for the assembly and handling of about 1,000 ball bearings an hour. The outer race is expanded by heating so that it can be snapped over the ball bearing assembly on the inner race. On top of the machine there is a well-insulated oven which is heated by air circulated rapidly from the fan seen underneath and passed over electric elements. This air is raised to about 400 deg. F., the temperature being thermostatically controlled.

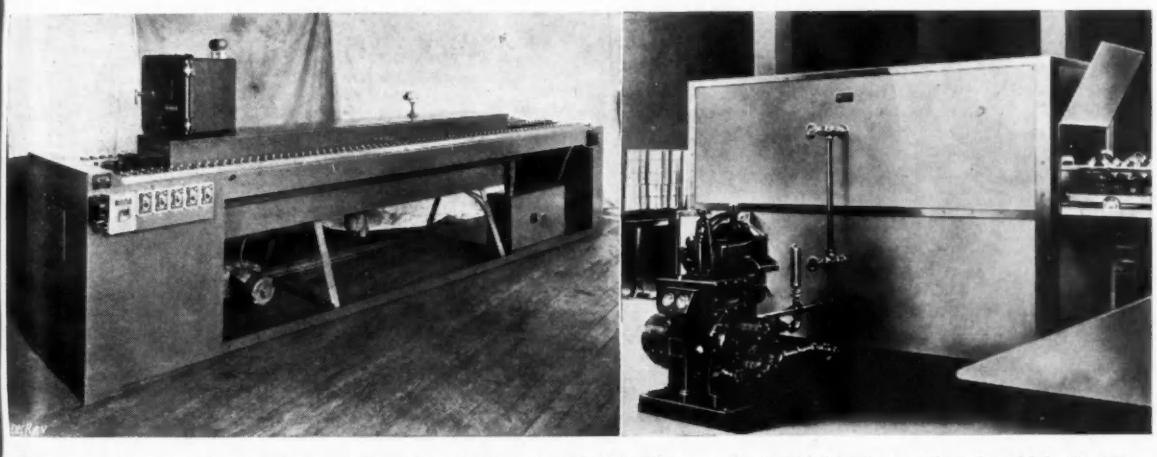
The outer races are passed through this oven on a conveyor while the inner part of the assembly, which does not require heating, travels on conveyors at the sides of the oven so that when the two portions reach the far end of the machine they are ready to be snapped together. Both the speed of the conveyors and the temperature of the oven are adjustable for different sized bearings, thus ensuring uniform results.

Another application in connection with ball bearings is also shown, the machine being a stainless steel cabinet wherein electrically heated rust-proofing compound is sprayed on to the ball bearings.

A special type of vulcaniser is used for attaching celluloid sheets to wood. The celluloid is cemented to the wood, but requires to be vulcanised at about 150 deg. F. under air pressure to prevent buckling, and then cooled before removing the air pressure.

In the equipment shown there is a 90-kW air heater at the far end of the cylinder. A fan with its motor is also placed inside so that the air under pressure is warmed and circulated to give an even temperature throughout. The heating period takes about twenty minutes and cooling fifteen minutes, the same fan circulating the air over a cooling unit built in the cylinder and supplied with chilled brine from a refrigerator plant. Before this equipment was installed the work was carried out in smaller cylinders heated by steam and cooled by mains water and without air circulation. The electrically operated plant has shown a very considerable saving in running costs and a much smaller percentage of rejected work.

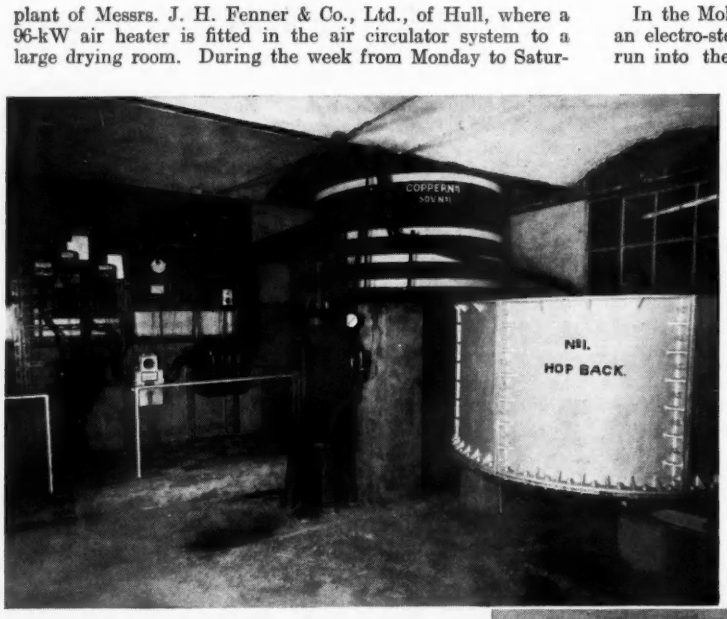
Another example of this kind is the

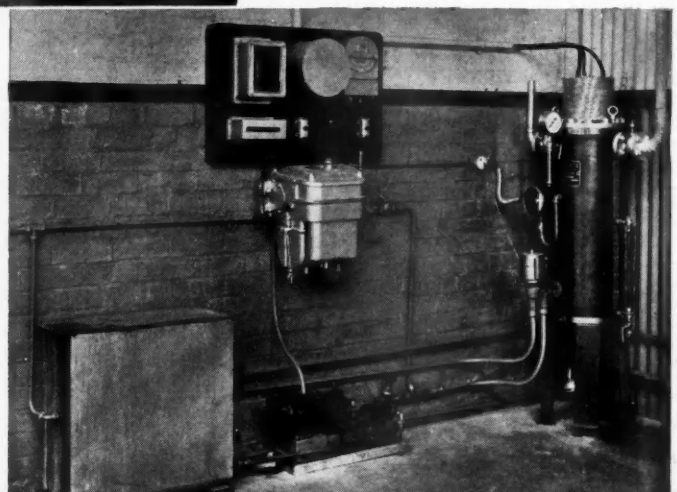


Special machine for the assembly and handling of about 1,000 ball bearings an hour and (right) a cabinet in which electrically heated rust-proofing compound is sprayed on to ball bearings

Vulcaniser for attaching celluloid sheets to wood

plant of Messrs. J. H. Fenner & Co., Ltd., of Hull, where a 96-kW air heater is fitted in the air circulator system to a large drying room. During the week from Monday to Saturday steam is taken from the main steam boilers to heat the drying room of about 16,400 cu. ft. Each night and during the whole week-end the electric heater is automatically switched on and maintains a temperature of 70 to 75 deg. F. Incidentally, this job had to be put in on a guarantee of consumption of electricity for a long period, and the actual results were well within this.





Electro-steam boiler plant at the Molesworth Poynings Brewery, Hassocks, Sussex, and (right) a 70-kW steam boiler in the factory of the Gee Manufacturing Co., Ltd., Liverpool

The electrically heated and well-insulated tank illustrated contains oil into which work is dipped for heat treatment, the temperature being automatically controlled.

The robust type of pipe heater which can be made waterproof and able to withstand high pressures is often made in special shapes to provide heat just where it is required.

Another application of a pipe heater requires the use of a straight pipe nearly 80 ft. long. It is inserted behind the guides for the gates on hydro-electric dams, the heaters being built into the masonry, so preventing the formation of ice on the guides and keeping the gates free.

The continuous type of coil heater illustrated can be made of copper, steel, lead or other tubing, and in sizes from ¼ in. pipe up to ¾ in., and in lengths which can be as much as 100 ft.

In the Molesworth Poynings Brewery, at Hassocks, Sussex, an electro-steam plant is used for boiling the wort which is run into the vat at a temperature of about 140 deg. F., brought to the boil and kept there for a specified time. This is a typical example of an excellent application. Steam is required two or three times a week, depending upon trade, and for a few hours at a time. The cost per brew of from 600 to 700 gal. at 0.4d. per kWh is 7s. 8d., and the owners say "the way the boiler maintains a constant steam pressure ensures an effective boil and good evaporation and shows a very real economy." A direct scheme was first considered, but the difficulties were great and the indirect method was adopted.

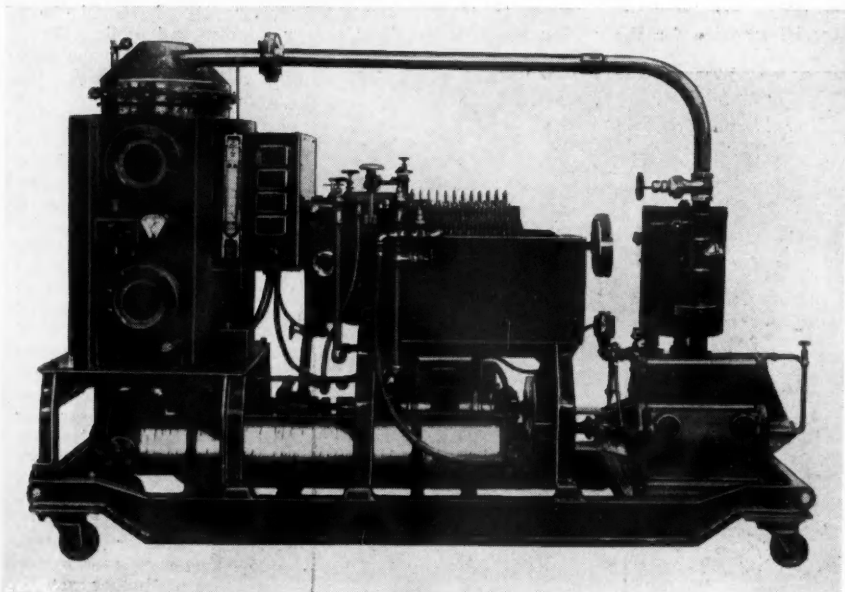
Another good steam job is that at Messrs. Thornton's, Ltd., Cotton Spinners, Halifax, where the cheapest method of raising the small supply of steam wanted for cleaning and degreasing spindles was found to be by the installation of an electric steam boiler.

A rather elaborate machine is used for a vacuum process in connection with oil for high-voltage oil-filled cables. Electrically heated oil is sprayed under pressure into the vacuum chamber at the right hand end of the machine, which is also electrically heated.

A further example of indirect heating by steam is in the melting of wax. A boiler supplies steam for a paper waxing machine, the wax tank that holds 1,200 gal. being fitted with a steam coil. With full waxing the work can be handled with the boiler set at 20 per cent. load, and on dry waxing, where the wax and drier rolls are heated to 190 deg. F., a 70 per cent. setting is needed. The latter process is but a small percentage of the work, and, in view of the small energy consumption and the speed at which work can be started in the morning, the electric plant can be used all the year round instead of in the summer only, as was originally intended.

When heating from a coal-fired boiler three hours were required to melt the wax in the machine, but the electric boiler set at 15 to 25 lb. per sq. in. pressure, does this in an hour and a half and, as it is started automatically by a time switch, the wax is ready when the works open. Another electric boiler for melting wax is working in the factory of the Gee Manufacturing Co., Ltd.

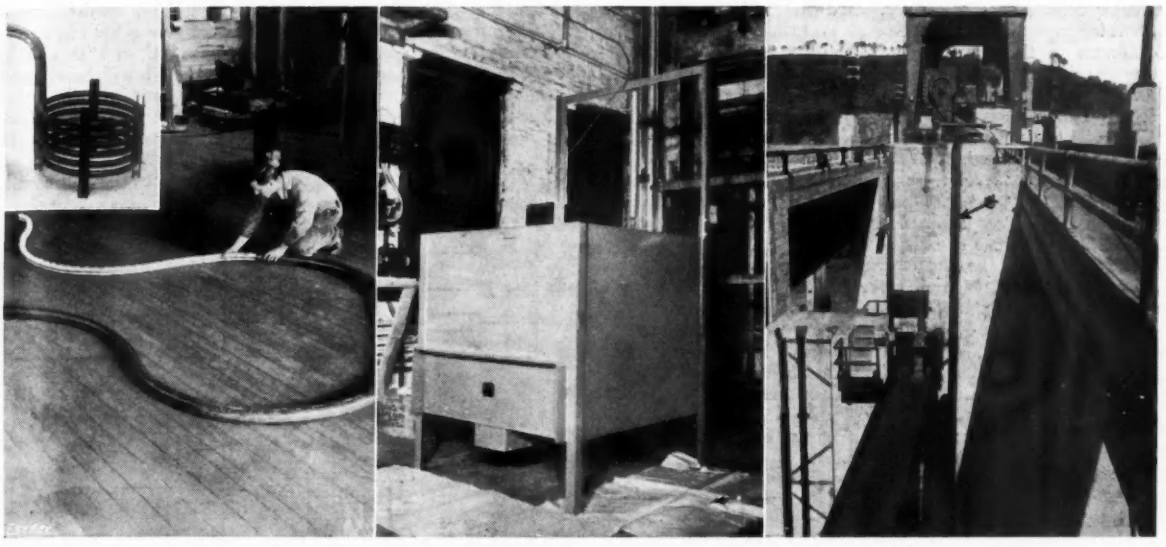
An electric heating installation deals with brass shells which are shrunk on to cast-iron rolls. The heater consists of a steel-lined pit sunk into the ground and electrically heated by elements rated at 100 kW surrounding the steel



Machine for vacuum process used in connection with oil for high-voltage oil-filled cables

shell. The advantages of the cleanliness and accurate temperature control are fully appreciated.

Considerable success has been attained in coating large steel conduit with bitumen. A double walled steel tank is buried vertically in the ground to a depth of 30 ft. or more and direct electric heaters having a total rating of about 200 kW are installed within the double wall. The temperature of the bitumen is raised to 450 deg. F., and the steel conduit is then lowered into it by means of a crane and withdrawn after soaking for the correct period. The previous method of heating was to use pipe coils and superheated steam, but the capital cost of the equipment and the running costs, including labour, have both been considerably reduced by the electrical method and a more uniform product is ensured. A recording thermometer shows that the temperature has been evenly maintained. When the tank is not required for use the temperature is dropped to that required to maintain the bitumen just in a molten state.

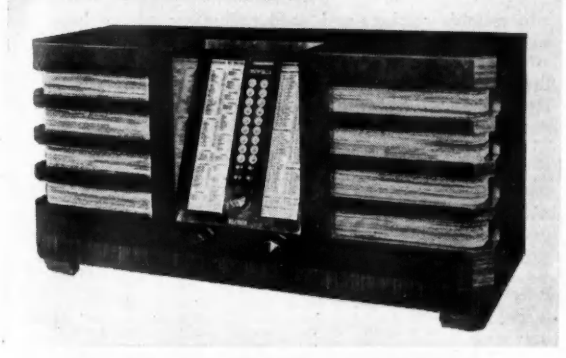


Left: Robust pipe heater which can be made waterproof to withstand high pressures; inset, continuous type coil heater. Centre: An electrically heated and well-insulated tank containing oil. Right: Pipe heater to prevent the formation of ice on the gates of hydro-electric dams

The Paris Autumn Radio Show

SEVERAL factors have contributed this year to reduce popular interest in the autumn radio show in Paris. One of them is that it is the second to be held this year. Another is that with sets becoming more and more complicated and more and more standardised, the possibilities of the home constructor picking up tips are reduced, while the choice of the customer depends largely on non-technical features.

From the standpoint of novelty, however, the show presented a certain interest, as it allowed one to see how the larger manufacturers have acted upon the guidance which they were able to glean from the spring show. In most cases the tendencies shown there have been carried out. This is particularly true in the case of variable selectivity, almost all makers now introducing this feature.



The " Coppelia " receiver with automatic tuning

Particular attention has also been paid to the development of the short-wave set, which has proved extremely popular, and the range of the cheaper sets has been extended somewhat to permit reception at 16 to 17 metres instead of the 20 to 22 metres of the earlier sets.

Television, on the other hand, seems to have gone to sleep again after the spurt of interest shown during the spring show. Although several makers had sets both on the direct transmission and on the film transmission systems, they are not pushing them as results so far do not encourage the customer to buy.

After the hesitancy of builders to make use of the metal valve, which was noticeable earlier in the year, the show brings out the progress that this idea has made, nearly all sets using metal valves, while those who still hesitate to use them are enclosing their glass tubes in metal sheaths.

Automatic sets continue to be shown, and several makers have extended the idea to a semi-automatic arrangement, with an auxiliary tuning knob for those who prefer it or for stations to which the buttons are not tuned. An interesting completely automatic set is the " Coppelia " in which tuning is by a set of four letters for the control of the bands and eighteen numbers for tuning within each band. These control the connections of a set of fixed condensers and permit variations in the capacity, while a small additional variable condenser permits the obtaining of any position between two buttons. Dual loud speakers are provided to improve the fidelity of the high and low notes.

An interesting tuning novelty is the A.M.I. panoramic dial, which covers the whole of the front of the set with a picture on which the names of the stations are indicated at distances indicating their comparative ease of reception.

Accident Statistics

Among the articles included in a special four-language issue *of Elektrotechniky Obzor* (Prague) is one by Karel Vesely stressing the need for international statistics of electrical accidents to aid in reducing such accidents to the minimum. The safeguarding methods mentioned include the framing and improvement of regulations governing the construction and use of equipment and appliances, the education of the public, particularly young people, and the inculcation of knowledge regarding first-aid methods. It is suggested (following proposals made at the meeting of the Union Internationale des Producteurs et Distributeurs d'Energie Electrique) that the work of collecting and collating the statistics should be undertaken by a committee of the national electrotechnical associations which should prepare a form to be completed by the staffs of electric power stations. In addition to the usual data, namely, the identity of the victim, the condition of the electrical apparatus which caused the accident, the way in which the accident occurred, and the administration of first aid, these reports would include additional details as to the intensity of the current and the length of time occupied by the accident. It is also suggested that subsequently, in order to measure the current, a constant resistance of 1,000 ohms should be put in the circuit in place of the victim of the accident. In this way the pressure and current would be correctly ascertained.

Evaluating Diversity Factor. By B. Ll. Price, A.M.I.E.E.

A statistical method

ALTHOUGH the standard definition of "diversity factor" is straightforward enough, being the diversity of a group of loads in relation to their summation maximum demand, it has been construed in as many ways as the Delphic oracle. Of greater consequence are the relative diversities of the constituent loads, and these must be such that their balanced average conforms to the standard definition. One thing which individual diversity factor emphatically is not is "the ratio of a consumer's maximum demand to his demand at the time of supply m.d."

Speaking in mathematical terms, a consumer is an "event," his load a "probability," while his diversity-factor is a measure of his "partial correlation" to all the other loads. It is instructive to make a correlation table for classified loads between pairs of consumers. An absolute positive correlation would be equivalent to unity d.f., while the absolute negative correlation would be the equivalent of maximum d.f. Such an exercise would exemplify the gist of this article, namely, that diversity factor must be evaluated according to the whole history of a load and not merely on the fortuitous occurrence of a transient peak.

The following underlying principles are easily proved:—

(1) The cost of each kWh varies inversely as the product of load factor and diversity factor.

(2) The diversity factor of a given load cannot exceed the reciprocal of its load factor.

(3) For any given summation load there must be as many diversity factors as there are independent constituent loads, *i.e.*, loads which are not mutually associated in a qualitative sense.

(4) In a group of loads having the same load factor the product of load factor and average diversity factor is equal to the load factor of their summation (L). Conversely, the average diversity factor (d) is equal to the summation load factor (L) divided by that individual load factor (l). This is a special case of general relationship. $\sum \frac{p's}{l.d} = \frac{P}{L}$ where P and p are total summation and individual units respectively.

Since $\Sigma p's = P$, it will be seen that if l and d are constant $ld = L$ and conversely $d = \frac{L.}{l}$

(5) In a group having the same load factor the ratio of the sum of their m.d.s to the summation m.d. is equal to the inverse ratio of the respective load factors. Thus $\frac{\Sigma x's}{X} = \frac{L.}{l}$

(6) Superimposed loads bearing a constant mutual relationship are equivalent to a single load in all respects. The implications of this are that their d.f. is unity, all have the same l.f., and that their form is identical.

Theorems 4, 5 and 6 are useful where a given load curve is known to be comprised of many small consumers. If an average l.f. can be assigned to them the time base of the group curve can be divided into consecutive sections each of the assigned l.f. Theorem 6 implies that any superimposition occurring amongst the actual loads can be entirely ignored.

Fig. 1 indicates such a division for an assigned l.f. of 20 per cent., wherein it would be immaterial how many superimposed loads were contained in each of the separate sections.

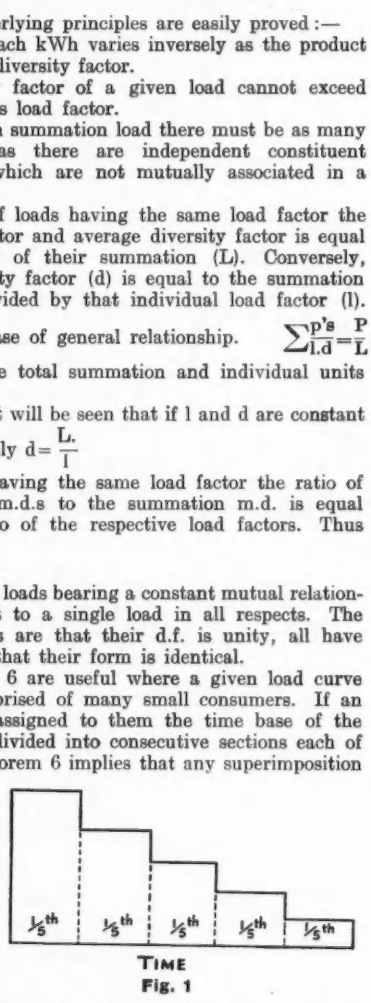


Fig. 1

Mathematical Corroboration Needed

If a supply authority had to choose between two identical consumers, one on the peak and one on the tail, the issue would not be in doubt, which demonstrates that the average diversity factor is not sufficient and some more analytical method of defining the effect on the supply of individual loads is required. Elementary logic would suggest that loads tending towards the peak should have less diversity than those tending towards the tail, and it is of vital importance that this philosophic inference should be translated into irrefutable mathematics. Not until then can be settled the legitimate charge to be made to the various consumers, nor the true value of off-peak loads.

Fig. 2 (i) shows four loads having their m.d.s on the supply peak. Here the d.f. is unity and there can be no reduction of charge.

In fig. 2 (ii) there are four loads of 25 per cent. l.f. having maximum diversity, which, however, is less than the limiting value equal to four for a 25 per cent. l.f. Observe how load D increases the diversity factor of C, and so on until loads D, C and B raise that of load A, notwithstanding that it is on the peak.

Diagram (iii) shows one load A of 100 per cent. l.f., one B having its m.d. off the peak and loads C and D on the peak. Clearly, A can have no diversity and will be charged accordingly, neither more nor less whatever are the other loads. Load B will get a considerable reduction, but a complementary reduction will be shared by C and D despite their being on the peak. Lastly, (iv) illustrates how a load A can improve the tail of the supply curve, yet, by having a m.d. on the peak, neutralise the good effect, the resultant d.f. in this instance being unity.

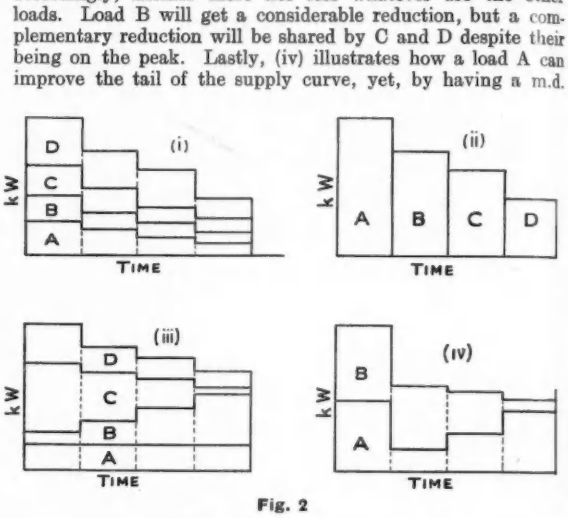


Fig. 2

These diagrams lead up to the following observations: The limit of charge to a consumer must not be higher than that corresponding to his m.d.; for instance, a 100 per cent. l.f. must not be penalised for any bad supply l.f. The reductions in cost due to off-peak loads must be mutually shared by all loads or portions of loads higher up the supply curve. The lower limit of charge is such that the amount per kWh is that for a 100 per cent. l.f. Qualitative independence of loads may be assumed if each official agreement for the supply of energy is deemed an individual consumer.

According to the last statement, an individual consumer may be anything from an artisan's cottage to a community receiving a bulk supply, provided there is but one agreement in each case.

How to Proceed

The following has been devised to conform with the principles laid down. Suppose the supply load curve to be plotted for a period of one year in order of magnitude of demand; it will probably be a "J" type of curve. Divide the time base into suitable sections and erect ordinates; where these intersect the curve draw horizontals. The curve is thus partitioned into sections of time and zones of decreasing load factor. By theorem (1) the relative cost per kWh in each increment is inversely as the l.f. of that increment. If, therefore, for each section a balanced average is made of the reciprocals of increment load factors this will represent the relative cost of kWh within that section.

1	2	3	4	5	6	7	8
Load.	Max. demand.	Load factor.	Total of limits.	Total of gains.	Equivalent max. demand (4) − (5) ÷ 10.	Equivalent diversity factor (2) ÷ (6).	Rel. unit cost = 1 / (3) × (7)
A	480	0.592	4,800	416	439.3	1.10	1.50
B	450	0.573	4,500	234	426.6	1.06	1.64
C	2,200	0.436	22,000	3,187	1,881.3	1.17	1.97
D	2,900	0.436	29,000	4,021	2,497.9	1.16	1.99
E	6,100	0.340	61,000	8,039	5,296.1	1.16	2.53
F	2,000	0.352	20,000	3,278	1,672.2	1.20	2.37
G	350	0.306	3,500	703	279.7	1.26	2.58
H	4,600	0.260	46,000	17,477	2,852.3	1.62	2.40
J	1,030	0.035	10,300	1,944	835.6	1.23	23.20
Equiv. aggregate	20,110	0.342	201,100	39,310	16,180	1.24	2.37
Supply...	16,180	0.422	161,800	0	16,180	1.00	2.37

Fig. 3

Suppose, also, that every consumer's load is dealt with in like manner, the sections corresponding to those on the supply

curve. Then the cost per section of supply will represent what must be obtained, while the costs on consumers' curves will represent the limit they must pay in each section, unless an occasion arises like diagram (ii) of fig. 2. The loads should now be superimposed on the supply chart, but arranged in the correct sections, so that their summation coincides with the supply. The cost of each section is now shared proportionally to the respective demands, except where consumers are up to their limit, in which case the excess must be borne by the remainder and always in proportion to their sectional demand. If the relative cost per kW or load for one year is represented by unity, then the ratio of m.d. to the total of the sections for each curve will be the equivalent diversity factor of that curve.

This process is set out in the table, in which, however, the basic charge has been taken as ten instead of unity. Such, in brief, is a rational method of evaluation. Absolute accuracy would necessitate an infinite number of sections to which the nearest approach would be hourly ones. Even this, however, is quite unnecessary, and ten main sections subdivided towards the peak will generally be found sufficiently accurate, the consumers' loads being averaged in each of the sections.

Certain expediencies are involved in approximating, these being such that errors tend to cancel out. In the first place, I did not plot 8,760 hourly readings, but chose representative daily samples of loads on the main feeders from various seasons of the year, noting also the annual m.d.s. Their limits were calculated on assumed constituent l.f.s mentioned in theorems 4 to 6.

All the calculations in the table were done by a student engineer without specialised instruction. Widely differing loads have been included; for instance, B is a flour mill, E a rolling mill, G public lighting and H a residential load comprising lighting, heating and large peak demands for cooking. Load H is a good example of a high d.f. compensating for the low load factor of its constituent loads, whereas load G is a typical example of a number of consumers having a relative d.f. hardly greater than unity. Load J is particularly notable, as its relative unit cost is 23.2; yet if it had been at the tail the cost would have been less than that of load A.

Some readers may remark that the foregoing method is not according to any orthodox statistical analysis. The title, however, focuses attention on the fact that this and its subsidiary problems are for a statistician.

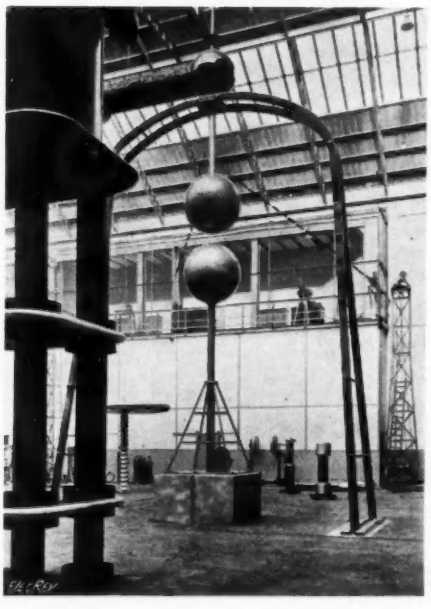
Measuring Very High Voltages

Method devised by a German professor

EQUIPMENT for measuring voltages up to about one million (r.m.s.) and one and a half million (peak) was recently made by Messrs. Hartmann and Braun, Frankfurt, for the high-voltage laboratory of a large Continental firm.

We are informed by Messrs. Kandem Electrical, Ltd., that the voltage is stepped up by transformers and passed along a thick tube, at the end of which is a sphere suspended from the roof by insulators. Beneath this sphere, suspended from an arched support of insulating material, is the upper of the two test spheres which have a diameter of approximately 125 cm. The test sphere is electrically connected with the upper sphere by a mechanically flexible shaft so that vibrations occurring on the roof are not conveyed to the test sphere.

The lower sphere is earthed and its height is variable. An indicating device at the foot of the structure enables the gap between the two spheres to be read off accurately. To determine the peak voltage, the lower sphere is raised until a flash-over occurs, since if the diameter, gap and barometric pressure are known the peak voltage can be easily ascertained. If the gap is fixed, the voltage can be raised until the flash-over occurs.



General view of the apparatus

By these two methods one can only ascertain that at the time of flash-over a peak voltage of, for instance, at least 700 kV existed, but no indication is available of the value of the voltage before and after attaining the r.m.s. value. Prior to flash-over nothing is visible; after flash-over the high-voltage transformer is very unfavourably loaded by the arc, so that the value read off the voltmeter on the primary side of the transformer gives no clue to the voltage conditions of the spheres and consequently no information regarding the object which is under test.

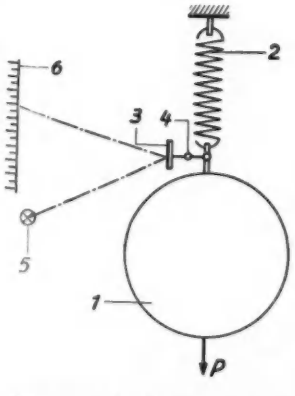


Diagram showing method of operation

Professor Hueter, of the Technical University of Darmstadt, has designed a device wherewith the r.m.s value can be continuously observed by the use of standardised spheres.

The diagram herewith shows how sphere 1 is suspended by a spring 2 of special steel, the modulus of elasticity of which is independent of temperature within a wide range. By virtue of the electrical field between the spheres the upper sphere is drawn downwards by a force P. The weight of sphere 1 in this case is approximately 150 kg., the force P approximately 1 kg., and the distance the sphere travels at maximum voltage is approximately 1 mm. During the movement of the sphere a small mirror 3, which is fixed to the vertical spindle 4, is diverted about that axis. A beam of light from the source 5 is projected on to a mirror 3, and reflected on to the scale 6. The motion of sphere 1 is damped by a plunger (not shown) operating in an oil dash pot.

In the illustration of the measuring equipment the source of light can be seen on the control board on the right. The spring and the mirror, as well as the damper, are built into the shaft of the upper sphere so that the application of the equipment as a spark gap is not affected. The shaft of the sphere has a small aperture through which the beam of light is cast on to the mirror and reflected on to the scale, as indicated by dotted lines.

The distance between the mirror and scale is approximately 16 metres. The graduation of the scale is carried out on "transparent solution" glass and can be easily read off from any distance in the test room as well as from the control gangway. The motion of one millimetre of the sphere is conveyed to a scale two metres long, *i.e.*, it is magnified in a ratio of 1 to 2,000. Investigation has shown that no errors occur due to friction, elastic reaction or temperature.

The force with which the upper sphere is attracted downwards is exactly proportional to the square of the voltage between the spheres and approximately inversely proportional to their distance. Professor Hueter, in conjunction with his students, has obtained by tests the relationship between voltage, distance and mechanical force. In consequence, it is possible to calibrate the sphere voltmeter very easily, thus: in a preliminary test the force P is calculated for a series of voltages; on the upper sphere, around the shaft, weights are placed, corresponding to the force of attraction, and the position of the reflected beam of light on the scale is noted for each respective weight, corresponding to the voltages.

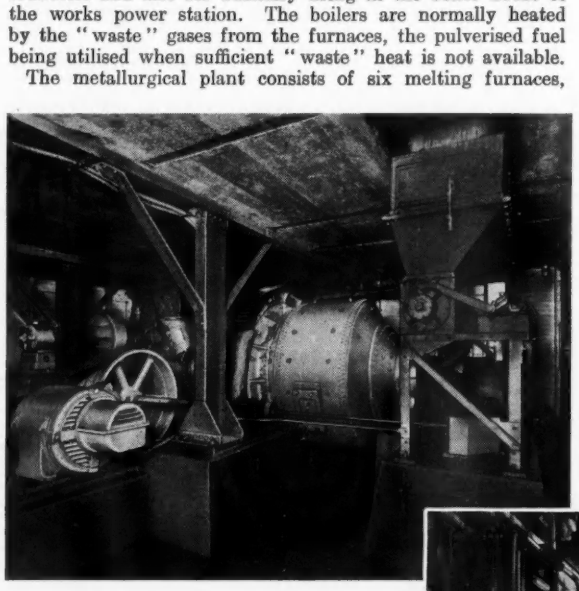
The gap between the spheres is always adjusted so that no flash-over occurs. It is only when measuring the peak voltage that the two spheres are approached until the flash-over occurs. In this case, the maximum motion of about one millimetre of the upper sphere creates very minute errors, which can be compensated for, since the movement of the upper sphere can be deduced from the position of the beam on the scale.

Electrically Operated Pulverised Fuel Plant

The system in a Derby foundry

AT the works of Messrs. Leys Malleable Castings Co., Ltd., Derby, pulverised coal is employed in the melting furnaces and annealing ovens in the foundries and also for auxiliary firing in the boiler house of the works power station. The boilers are normally heated by the "waste" gases from the furnaces, the pulverised fuel being utilised when sufficient "waste" heat is not available.

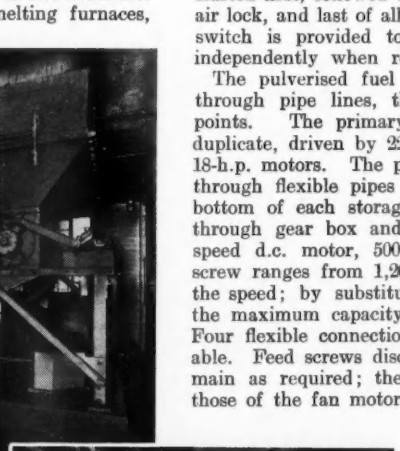
The metallurgical plant consists of six melting furnaces,



twenty-four annealing ovens and four reheating furnaces. To the original 300-kW. turbo-generator two 1,350-kW sets have since been added. There are two complete pulverised fuel handling and storage plants, both of which were supplied by the Fraser & Chalmers Engineering Works (G.E.C.), and are electrically operated, the motors and control gear being interlocked so as to ensure that the elevators are started before the feeders.

A Ruggles-Coles type dryer reduces the moisture content from 15 to 2 per cent. and is fed with hot gases generated in a small hand-fired furnace burning about 45 lb. of coal per ton of coal dried. The fines carried away by the exhaust gases from the dryer are recovered by passing them (by means of a fan) to the top of a Fraser & Chalmers Cheltnam "Micron" precipitator. The dust so precipitated is fed through a pipe and rotary air lock to join the dry coal at the discharge end of the dryer, while the cleaned gases pass to atmosphere through a stack pipe. The dryer equipment is provided with a 12-h.p. motor driving line shafting.

An air-swept ball mill of the Hardinge type reduces the coal from 1¼ by ¾in. to a fineness such that 85 per cent. will pass through 200 B.S.S. mesh; it is geared to a countershaft driven through vee-belts by a 60-h.p., 725 r.p.m. slip-ring motor. The coal-laden air is extracted by a fan (driven by a 20-h.p. motor) and delivered to the top of a cycle separator. The mill is fitted with air classifying equipment and is operated with a closed air circuit with a slight vent to compensate for leakage on the suction side, and the plant is kept free from dust by tapping this vent to a Roots blower; part of the air is thus taken to a bag filter, where any dust entrained in it is recovered and delivered through an air lock to the storage bins. The control gear is interlocked so that the fan and the cyclone and filter air lock must be started first, followed by the mill itself, then the precipitator air lock, and last of all the dryer and its feeders; an isolating switch is provided to allow the drying plant to be run independently when required.



Top: Hardinge ball mill driven by a 60-h.p. G.E.C. slip-ring motor; at the back on the left is the mill fan driven by a 20-h.p. squirrel-cage motor of the same make. Bottom: Motor control gear, showing the d.c. timing starters for the feed screws and push-button-operated contactor starters for fans, &c.

The pulverised fuel is distributed by primary air blown through pipe lines, the coal being sucked in at suitable points. The primary air supply is provided by fans, in duplicate, driven by 22-h.p. motors, and the blower fans by 18-h.p. motors. The pulverised coal for the fuel lines is fed through flexible pipes from three 8 in. feed screws at the bottom of each storage bin, each feed screw being driven through gear box and roller chain by a 1½-h.p. variable speed d.c. motor, 500/1,500 r.p.m. The capacity of each screw ranges from 1,200 to 3,600 lb. per hr., depending on the speed; by substituting chain drives of different ratio the maximum capacity can be reduced to 1,700 lb. per hr. Four flexible connections are provided and are interchangeable. Feed screws discharge into any injector or circulating main as required; the motor starters are interlocked with those of the fan motors, so that if the latter are shut down for any reason the feed screw motors shut down automatically, and *vice versa*.

The constant speed drives are equipped with protected type a.c. motors running at 720, 950, or 1,450 r.p.m., and supplied at 400 V, three-phase, 50 cycles, from the works supply. The Hardinge mill is driven by a slip-ring motor, equipped with an air-break rotor starting panel. With this exception, squirrel-cage motors are employed throughout. Standard machines are used on the screw feeders under the silos and the rotary air locks, and high torque motors for the fans, Roots blower, dryer plants, and raw coal feeder and elevator. Motors below 10 h.p. are equipped with direct-to-line contactor starters, and the larger machines with stator resistance starters. In all cases the starters are push-button operated, and additional push-buttons are provided for remote control from convenient points.

Variable-speed drives for the pulverised fuel feed screws are provided by totally enclosed shunt wound motors fed at 220 V d.c. from the works supply. Each motor is equipped with an air-break timing starter provided with separately mounted push-buttons interlocked with a 31-point shunt regulator. Interlocking features are provided in other parts of the control gear where necessary.

The foundries and associated shops are illuminated by "Osira" mercury vapour discharge lamps in dispersive reflectors; altogether nearly a hundred 400-W units have been installed.

The Mettur Hydro-electric Scheme

THE latest development in the Madras Presidency is the laying of the foundation stone of the Mettur power house by the Acting Governor, Sir Kurma Reddy. The Mettur project forms part of a comprehensive scheme for the electrification of the Madras Presidency and is designed to generate a maximum output of 60,000 h.p. for supplying an area of 25,000 square miles with a population of 12,000,000. The scheme will be completed and put into operation before the end of 1937. The power house, a steel-framed structure, will be situated at the foot of the dam on the left bank of the Cauvery River. There will be three Francis overhung turbines and one more will be added as soon as power demand justifies it. Each of these will be capable of generating 15,000 h.p. From the power house will radiate three main high-voltage lines. The transmission is designed to form part of the future extensive grid system contemplated for the whole Presidency. In the first instance it will be interconnected with the Pykara hydro-electric system and there will be a limited interchange of power. The transmission and distribution lines together will be nearly 900 miles long. As soon as the power house is completed, the loads now supplied by Pykara will be transferred to the Mettur hydro-electric system.

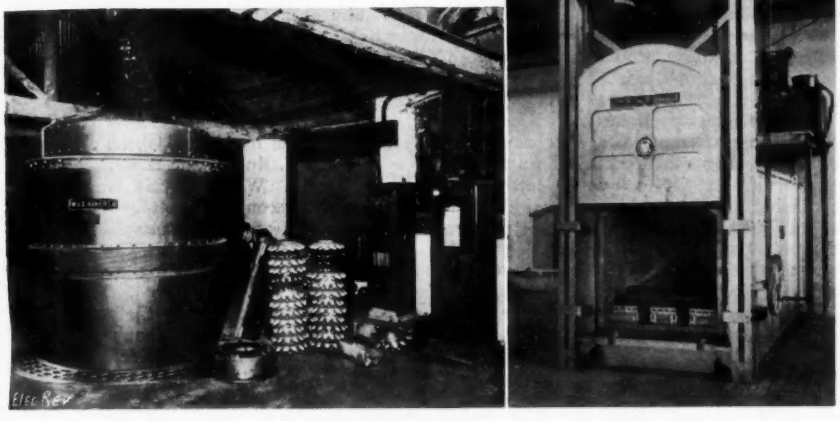
The Mettur scheme is reported to have great industrial possibilities, for lacking the supply of cheap power the manufacture of several products has been delayed. Rolling mills and machine shops, chemical industries for the manufacture of caustic soda, bleaching powder, and hydrogenation of vegetable oils for the manufacture of hydrochloric acid, paper and straw-board manufacture, electric furnaces for special alloys, have all good possibilities. Encouragement will also be given to irrigation by electric pumping. The scheme will cost Rs.130 lakhs, and will, it is estimated, yield 8 per cent. in the tenth year of operation.

Electric Furnace Fans. By G. B. Lamb, B.Sc., A.C.G.I.

A means of furthering the use of electricity for low-temperature treatments

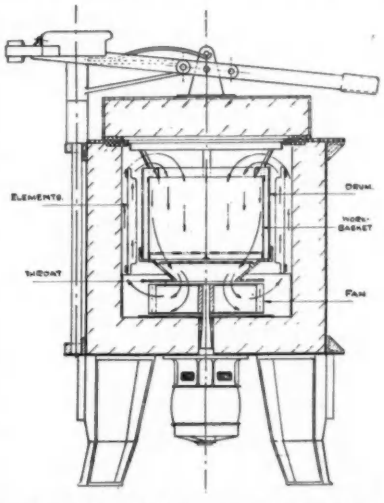
THE solution to the problem of increasing the rate of heating in electric furnaces for temperatures of say, 500 deg. C. and lower lies in the use of fans; these also give a better uniformity of temperature in the furnace.

Being usually round the modern vertical furnace lends itself readily to internal air circulation by a fan. An accepted design places the fan at the bottom of the furnace driven by a suitable electric motor with a heat-resisting steel shaft. Above the fan is a cylindrical metal drum between which and the inside wall of the furnace are the heating elements. The "work-basket" (charge container) stands inside the drum and has solid sides and a perforated bottom, so that air from the fan first passes over the elements from which it absorbs heat and then over the charge in the basket to which it delivers heat. Besides forming a baffle to direct the path of the circulating air, the drum also prevents direct radiation on to the charge from the heating elements, which would heat the outside of the charge more than the centre.



Vertical furnace for heat treating aluminium alloys (forced air circulation by centrifugal fan) and (right) box-type furnace for annealing non-ferrous sheets; fan in roof

The two-bladed type of centrifugal fan has so far been found to be best in that it combines effectiveness with cheapness and the ability to resist distortion under the working temperature conditions. The two blades are made integral with a thin disc, the whole being mounted on the driving motor shaft, and a fixed annular disc and a throat are fitted above the fan. The throat directs the air to the centre and the disc prevents air being sucked back into the centre of the fan. The disc under the blades directs the air flow and prevents the air being sucked into the fan *via* the packed, but not absolutely air-tight, space round the fan shaft. Without the disc, cool air would be drawn in with consequent hot-air leakage at the door "misfits." Although the air entry and exit arrangements are somewhat different for the propeller fan, the general principle is the same.



Section of vertical furnace with centrifugal fan

The size of furnace necessary for a certain output obviously depends on the efficiency of the fan. The diameter of the fan is limited by the diameter of the furnace chamber, and the centrifugal fan gives four or five times the suction pressure developed by a good design of propeller fan. Upon the suction pressure depends the volume of air drawn through the charge, especially where this is composed of small articles. The better the air circulation the smaller the furnace, which in turn means lower first cost. The operating costs are less for a smaller furnace because although the useful heat absorbed by the charge is the same for either size of furnace the losses of the larger furnace are greater, as are also the heat content of the insulation and the radiation losses. If the furnace is in continuous use the amount of heat stored in the insulation is immaterial, but when the furnace is shut down at night and over the week-end most of this stored heat is lost.

The action of the centrifugal fan in horizontal furnaces is somewhat different, in most cases no special air paths being provided. The fan is fitted in the roof of the furnace and sets up rotating air currents and eddies which maintain the air in a continual turbulence throughout the furnace, thus effecting heat transference from the heating elements to the charge as rapidly as possible. In larger furnaces equipped with charging machines and bearers in the furnace to carry the charge, the air circulates under the charge and through slots cut in the bearers.

In a long furnace requiring more than one centrifugal fan the problem for the designer then is how many fans to use. The volume of air circulated, if unrestricted, is dependent on (1) the speed of the fans, (2) the diameter of the fans, (3) the blade depth, (4) the number of fans. Therefore, to provide the maximum turbulence, all these factors should be as high as possible. It is not advisable for the peripheral speed, which is limited by the mechanical strength of the fan, to exceed 70 miles per hour, and thus factors (1) and (2) are closely related.

With direct-drive fans the speeds available, where a.c. is employed, are strictly limited, as it is usual to employ squirrel-cage motors because of their low first cost and ability to run for long periods without attention. If some form of gearing is used this, of course, does not apply, but with direct drive, as the motor speeds do not vary continuously, the maximum diameters which can be employed are also strictly limited.

Within certain limits, the volume of air circulated is proportional to the blade depth, but this could easily be increased too much, for additional blade depth means increased furnace height which raises the cost of the furnace. Further, the walls of the furnace mask the effect of the upper portions of the fan if the blade depth is too large. The number of fans which can be accommodated in the furnace obviously depends on the length of the chamber and the fan diameter, and as the effectiveness of the fans is dependent on their number it is better, if necessary, slightly to reduce their diameters if an extra fan can be included.

Generally speaking, the best rule to observe in choosing the number and diameter of fans is to choose factors so that the fans require the maximum driving power, which, quite apart from the turbulence it produces, is not wasted, as it reappears in the form of heat within the furnace.

Direction of Rotation

In what directions should the fans rotate to produce the greatest effect? It is better to employ alternate fans turning in opposite directions than all fans rotating in the same direction, as then they operate rather like a chain of gears and cause the air beneath them to do likewise. This produces the minimum of interference between the fans and thus gives a more effective turbulence to the furnace atmosphere. Although it is not necessary to direct the air through the fans in horizontal furnaces, discs are usually fitted on the fan shafts above the fans to prevent air being drawn down through the space surrounding the fan shafts.

Direct driving is most common owing to its simplicity, but to reduce the overall height of large vertical furnaces a belt drive from a horizontal motor is frequently advantageous. In horizontal furnaces with several fans a single motor with a suitable shaft and gearing is sometimes employed, but if a motor breaks down the furnace has to be shut down, whereas with independent drives the failure of one motor will not prevent the furnace from being used while the faulty motor is being repaired. With large fans it is essential to employ stiff bearing brackets and a shaft of large diameter, as owing to the thickness of the heat insulation the fan shaft has a large overhang and serious vibration may occur if suitable

precautions are not taken to guard against this. As a general rule the element and fan controls are housed together, the fan contactor being arranged to close when the main isolator is closed.

The door switch which is provided to isolate the furnace elements when the door is opened is arranged to open the fan contactor at the same time to prevent air being forced out of the furnace and thus causing loss of heat. Where more than one fan is employed, it is usual to arrange for one contactor to start all the fans, with thermal overloads in each fan circuit. This, of course, is considerably cheaper than having separate contactors with overloads for each fan, and gives adequate protection in the event of motor failure. For a large fan where belt drive is employed, star-delta starting is sometimes used, as owing to the large inertia of the fan it is possible for the belt to slip off if the starting torque is too high.

In conclusion, it can be stated that the advent of the fan has been mainly instrumental in furthering the use of electric furnaces in industry for low-temperature treatments, owing to the high-class product which can be produced. These furnaces give high outputs comparable with those obtained from oil and salt baths, and have the advantage of cleanliness, high efficiency and low running costs.

Electricity in Iron and Steel Production

Discussions at a joint meeting of British and German technicians

THE annual autumn meeting of the Iron and Steel Institute was held at Düsseldorf (September 21st to 26th), at the invitation of the Verein deutscher Eisenhüttenleute, whose president, Dr. Ing. E. L. F. Springorum, presented the first paper. In this he reviewed technical developments in German iron and steel production during the last fifteen years.

The paper points out that charging plant for blast furnaces is nowadays mechanised so far as is possible. In some cases simplified and more rapid operation has been attempted by the construction of overhead motor-driven trolley conveyors; in others preference has been given to vertical lifting by means of a crane over-running the charging platform, which method gives better results when several furnaces are placed in a straight line. The operation of hot-blast stoves has been considerably simplified by the adoption of wholly or semi-automatic remote control, which simultaneously increases the reliability of operation. Cast-house cranes, provided with pig-breakers and lifting magnets, are now substituted for manual labour, while for gas cleaning the electro-filter has been accepted as a reliable large-scale plant.

Apart from the larger dimensions of electric smelting plants, steelworks appear to have undergone little change Increasing importance is being attached to duplex processes, such as the combination of the basic Bessemer with electric furnaces. The electric heating of ingot tops is another electrical application which is favoured.

Electric Furnace Practice

While the low-frequency induction furnace has been almost completely ousted, the electric arc furnace to-day still stands in the front rank. Its operation was considerably cheapened by the co-operative work of the German electric steelworks, *e.g.*, with regard to its efficiency, the power consumption during melting, and the most suitable dimensions of the transformers. Further economies were produced by automatic electrode control, by a special or simplified method of charging, and also from the metallurgical standpoint, *e.g.*, by decreasing the melting loss in the case of alloying metals, &c. Other lines of investigation on the electric-steel furnace were also indicated in a comprehensive report bearing on the entire field of constructional, electro-technical and operating conditions in all the Central European electric steel furnaces.

In spite of these considerable advances a change can be noted in the case of electric steel melting, in that, owing to the development and considerably extended application of the coreless induction furnace, one can no longer speak of the supremacy of the electric arc furnace. The capacity of these latest furnaces, which originally lay between 200 and 300 kg., has meanwhile been raised to 5 tons, while the field of application which primarily served only for melting or remelting, was also considerably extended. Extensive investigations were specially made with regard to the problem of making the coreless induction or high-frequency furnace capable of carrying out the metallurgical processes. The initial task was to make decarburisation possible in this new melting plant; then followed investigations with respect to the dephosphorisation and desulphurisation of the steel bath, which have now also been crowned with success. In any case, there is already a metallurgy of the coreless induction furnace. The development of this specialised problem is, however, still far from being completed.

Rolling Mill Plant

In rolling mills regular cutting of the product into definite lengths not only speeds up the work, but also ensures a noticeable increase of output. Schulte shears and electric impact shears have gained special significance. Their control may be effected by means of stops, or photo-electric cells may be employed.

The electric roll is a widely introduced innovation in rolling mills, and its design provides a formerly unknown freedom of movement, while, in view of the possibility of substituting individual spare parts, it also ensures a reliability in operation not known before. Considerable advantages have been attained by the introduction of electric couplings, of which the type known as the Bibby coupling is most extensively employed.

Characteristic modes of failure of rolls used for cold rolling operations in steel mills of the backed-up type are examined in a paper by Messrs. G. A. V. Russell and S. S. Smith (I.C.I Metals, Ltd., Birmingham). When heating such rolls for hardening them the authors recommend rotation in a vertical electric furnace containing a controlled atmosphere.

A paper by Herr A Nöll (Geisweid, Siegen, Germany) deals with the layout and arrangement of rolling mills designed for differing classes of product.

The determination of the gases in steel by the hot extraction method is the subject of a paper by Herr G. Thanheiser (Kaiser-Wilhelm-Institut für Eisenforschung, Düsseldorf). For this purpose the author has, jointly with Herr. E. Brauns, devised a vacuum short-circuit furnace that is water cooled and coupled to a diffusion pump. The sample is melted in a graphite crucible, the resulting gases being pumped off and analysed The temperature is measured through a glass window. At a temperature of 1,600 deg. C. about 7.5 kW of electricity is required.

How to determine the constitution of non-metallic inclusions in iron and steel is discussed in a paper by Messrs. F. W. Colbeck, S. W. Craven and W. Murray (I.C.I. (Alkali), Ltd., Northwich). The vacuum fusion method (mentioned above) has limitations, and methods depending on solutions in acid are regarded as of little value.

Electrolytic Process—Further Investigation Needed

The electrolytic solution method, in which the specimen is made the anode, is impracticable at present owing to the difficulty of controlling certain factors, especially the hydrogen-ion value of the electrolyte; also carbides probably remain unattacked by this method. Theoretically, the basic principle is sound, and the authors feel that further investigation might surmount many of the obstacles. They also suggest that crystallography and X-ray analysis might prove useful for this purpose.

The Stathmograph

Drs. A. E. Dobner and St. Skramovsky (Institute of Applied and Pharmaceutical Chemistry of the Charles University, Prague) have investigated the direct reduction of iron ores of both Czechoslovakian and foreign origin with solid carbon by means of a stathmograph (*i.e.*, apparatus which records automatically in the form of a graph the loss of weight during the whole reduction process).

A chemical balance is connected with an electric resistance furnace, capable of producing a temperature up to 1,100 deg. C., by means of a platinum wire or a very fine thread of quartz or porcelain, at the end of which is the experimental vessel, hanging freely in the middle of the furnace and containing the ore sample; on the other side, the balance is in connection with the rotating part of a motor-driven recording drum through the medium of a fine horizontal beam of light from a lamp and reflected by a mirror in the middle of the balance beam on to the drum, just crossing a slit.

When the vertical slit is open the horizontal beam of light crosses it at right angles, and a point appears on the sensitive photographic paper on the drum. The combined motion of the point, caused by the horizontal movement of the paper, and the vertical displacement of the beam during the loss of weight, draws a characteristic graph, marking the continuous change of weight of the sample in the electric furnace as the time progresses.

Electro-plating

Recent advances in technique

IT is now just a hundred years since Daniell described his cell, which was the first primary cell to provide a steady current suitable for electro-plating under industrial conditions. The exhibit arranged by the Electro-depositors' Technical Society during the meeting of the British Association was therefore especially appropriate; so was also the allocation of a morning for a discussion on electro-plating in the Chemistry Section.

This discussion was opened by Mr. D. J. MacNaughtan, who mentioned chromium as the only metal to serve the dual purpose of forming an alloy with steel for improving its mechanical properties and of providing a surface that resisted tarnishing. Its effectiveness in the first instance is limited to steel, but for exterior treatment it is applicable to fourteen metals of the most intricate shapes. The thickness of the deposit varies from three-thousandths of an inch with lead to only a few millionths of an inch (sub-microscopic and a fraction of the wavelength of visible light) with gold, platinum, palladium and rhodium, which is enough to maintain the lustre for many years of the articles treated.

A coating of chromium two hundred-thousandths of an inch thick on an initial covering of nickel one-thousandth of an inch thick provides satisfactory protection for outdoor fittings. Its value for this purpose is due to the presence on the surface of the metal of an air-formed oxide film about one ten-millionth of an inch thick which repairs itself immediately when broken.

The quality of the coating and the cost of process in electro-plating are determined by the control of the two stages of cleaning and deposition, to which Mr. A. W. Hothersall drew attention. Cleaning solutions act more rapidly when assisted by the scouring of gas bubbles liberated at the surface of the metal by the passage of an electric current. If the coating be made thick enough most electro-deposits can be made free from pinholes, *e.g.*, tin coatings must usually exceed 0.0005 in. and nickel 0.0015 in. Nickel, copper and many other metals can be electro-deposited in a harder and sometimes also a more ductile condition than is achievable by any mechanical methods of cold working.

The Cost of Corrosion

Dr. S. Wernick contributed some notes on corrosion prevention in which he estimated the loss due to corrosion of ferrous metals alone at not less than £2,000,000 per day, and the sums spent annually in resisting it to about one-fifth of that figure. Prevention was sought for mainly in surface coating. Electro-deposition gives certainty of control of thickness of coatings at every stage over a range that extends from gold so thin that print can be read clearly through six layers separated by air gaps to deposits millions of times greater.

Metal deposits, such as zinc and cadmium, that are electro-negative to iron are the most effective and are being produced by electrolysis to a rapidly increasing extent. Even where the deposit is discontinuous the iron exposed to the atmosphere is protected, since a " battery " is formed between the contact of the basis and deposited metals, the electrolyte being represented by the moisture in the air, which contains carbonic acid. Metals anodic to iron, such as zinc and cadmium, corrode sacrificially and thus protect the latter.

Optimum operating conditions have been determined, and marked departure from these changes the structure of the deposit and affects its corrosion-resisting properties. Uniformity of deposit depends upon the " throwing power " of the electrolyte.

Anodic oxidation of aluminium is the thickening of the natural oxide on the surface of the metal by making the latter the anode in a weak chromic acid, sulphuric acid or oxalic acid electrolyte (among others). The film, besides being mechanically resistant to abrasion, has been found to withstand up to 1,000 V, thus giving a well-insulated conductor. Heat radiation and light reflection and diffusion are improved; the last, with its other properties, makes anodic aluminium suitable as a reflector for searchlights and floodlights. It readily absorbs dyes, and colour finishes will withstand atmospheric conditions and various chemicals. Impregnation of the oxide layer, when first produced, with grease gives even higher resistance to corrosion.

Materials that are most easily deposited tarnish quickly, even though they may protect steel against severe corrosion. Chromium presented technical difficulties in reduction by electrolysis commercially, but recently means of controlling the plating solution and of regulating the temperature and current have become better understood. In dealing with non-tarnishable finishes, Mr. E. A. Ollard shows that direct application of chromium to the base metal gives good results only with nickel silver; steel, brass and copper are inadequately protected due to the porosity of the coating; thicker deposits often cause cracks, due to internal stresses that are even more detrimental.

The present procedure is to coat the base metal with nickel (0.001 in.) and then to apply a thin flash of chromium (0.00002 in.). For depositing the nickel a bath of nickel sulphate solution containing boric acid and chloride is used. The solution is agitated and worked warm with constant filtration and movement of the article. In some cases the addition of cobalt salts and sulphonated benzine compound to the nickel solution will produce a bright deposit on the nickel, which need not then be polished before chromium plating.

Rhodium, which is hardly attacked by aqua regia, is hard, chemically inert, and unaffected by atmosphere (even at low red heat) and has a high reflectivity, provides the best protection of silver or other valuable metal; a thickness of only ten-millionths of an inch is needed. Its high melting point (1,985 deg. C.) and untarnishability and immunity from damage by sputtering from an arc make a rhodium-plated reflector superior to silvered glass for projectors.

A 12,000-gallon Plant

Among the advances in industrial electro-plating, Mr. C. J. F. Francis-Carter stated, is the introduction of automatic units to cover the whole process, including pre-treatment. There are twenty-seven such plants at work in this country. Articles for treatment are hung on suspenders attached to cross-rods resting on conveyor chains which move over the tanks in sequence at a speed appropriate to secure the correct period of immersion. The cross-bar is raised from one tank by an auxiliary chain and lowered into the next rapidly enough to obviate risk of drying off or tarnishing.

The largest plant in Great Britain has a plating-tank capacity of 12,000 gal. of solution, containing 13½ tons of nickel sulphate and five tons of nickel anodes. The total weight of nickel used annually in electro-deposition is 5,000 tons, enough to plate 250 million sq. ft. to a thickness of 0.001in.

In considering the future of electro-plating, Dr. H. J. T. Ellingham expressed the opinion that more precise control would lead to further improvements in quality and reliability and that the number of metals deposited would be increased. Thirty metals are known to be capable of electro-deposition from aqueous solutions, fourteen of which are so treated. Of about forty other metals many are produced commercially by electrolysis of their molten salts, but deposits suitable for plating may perhaps be obtainable from solutions of these salts in solvents other than water.

Coatings of tungsten, molybdenum, manganese, iridium, aluminium and beryllium seem likely to find applications when satisfactory deposition processes have been devised, and no metal is so rare that the possibility of its commercial electro-deposition in thin coatings can be ignored. By simultaneous deposition of two or more metals, alloys having different properties from those of the constituent metals may be obtained in an unlimited range. Tin and copper have already provided a bronze suitable as an under coat for chromium.

Cold-rolled continuous-strip steel is easily amenable to electrolytic pickling and subsequent tin-plating by electro-deposition instead of dipping. This process is already being brought towards large-scale operation. By electro-depositing a non-adherent coating on a mandrel rotating in a plating bath, seamless tubing and copper is being produced which can be formed into metal sheets of controlled physical structure and chemical purity that are more suited to cold working than is rolled sheet; two metals can be deposited to give bi-metallic sheet. Developments in this field are likely to simplify many industrial operations and hence open up a further range of applications.

Instrument Transformers

A revision of B.S.S. 81 on instrument transformers shows that the applied high-voltage test is now based upon the system conditions (*i.e.*, whether normally earthed at any point or not). An induced-voltage test has been included, either in addition to the applied high-voltage test or in place of it (*e.g.*, when one end of a winding is to be earthed). The requirements as to accuracy have been tightened up, and two classes have been added to meet metering requirements in which a maximum permissible *change* of ratio and phase-displacement is laid down in addition to their absolute values. Two classes have also been included particularly suited to laboratory and high-class test-room work. A new requirement has reference to temporary overloads. Copies of the specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

The Control of Power Resources

Further notes on the Third World Power Conference

SHARP differences of opinion regarding the management of American gas and electric utilities appeared in some of the papers submitted at the World Power Conference, Washington, especially in those submitted by utility executives and by Government officials on the question of public or private ownership.

The trend throughout the world has been towards the consolidation of the facilities in each country and the results of such consolidation have been satisfactory. A growing appreciation of the importance of gas and electric utilities in modern economic life is indicated by the extension and centralisation of the regulating commissions in most countries.

With a warning that the world supply of natural fuel and power resources is being depleted at an alarming rate, papers submitted on this subject revealed the outline of a concerted universal conservation movement. Specific recommendations included in the papers were for the development of more efficient machinery for the extraction and combustion of fuels, regulation of competition, construction of great underground reservoirs for storing surplus oil, intelligent use of soil with a view to land and forest conservation, full use of water resources, and reduction of waste of delivered power.

Government Intervention

Papers submitted from all parts of the world served as the basis for a discussion of the rôle of government in developing and integrating power systems. Particular attention was paid to the American developments in the Tennessee Valley and the Pacific Northwest. From the American standpoint serious variations of opinion were revealed, not alone among representatives of industry but also between Government experts themselves. Such varied suggestions were put forward as constitutional amendment, pooling of Government and private power, a Government "hands-off" policy, possibility of the abandonment of long-distance transmission of electricity, &c.

The small-unit Diesel engine which would do away with long transmission lines by permitting the establishment of a number of small stations, and the process, now at a promising experimental stage, of the direct transformation of coal gas into electricity by a chemical process, were mentioned as possible future rivals to both steam and water power development.

The question of integration in Europe has largely been taken over by Government order; in England, France and Germany close co-operation is being ordered between all systems. Sweden is undertaking a network which will stretch along its coast line for roughly 2,000 miles.

The question whether the development of power and natural resources should be carried on along strictly business lines by private industry or administered as a social function by the State was the basis of papers forming a ground for discussion at the last technical session of the Conference. In France, no rigid system of planning is contemplated, but development is to proceed along the lines of democratic government with private industry allowed freedom, Government direction being aimed at conservation of human and natural elements. Over-rigid control is protested against.

The Argentine power policy is chiefly concerned with oil, this Government controlling the development of oil lands; in Czechoslovakia coal is the main item for consideration. Austria has abandoned at present any idea of socialisation of power; on the other hand, in Sweden, where by an historical accident the State found itself owner of most of the sources of power, the State has entered the field as a competitor with success in the promotion of a national policy. Hungary is concerned with a shortage of fuels and standardisation of transmission facilities and rates.

Germany has adopted a middle-road policy between planned economy and "*laisser-faire*." Operation is divided between public and private enterprise, but the State has retained the right to influence industry in the interests of the nation.

Electricity and Finance

At one session of the Conference the utilities were warned by Judge Robert E. Healy, of the U.S. Securities and Exchange Commission, to liberate themselves from the "jugglers of finance" and to devote their efforts to the production and sale of gas and electricity rather than the production and sale of securities. In opposition to this M. Max Frederick Horn (Sofina) maintained that the holding company was the salvation of utilities the world over. He said that Europe was watching with apprehension the working out of the American holding company law, and hoped that the result would not be the destruction of the holding company system.

M. Michael Deutsch (Belgium) expressed the opinion that holding company practices should not necessarily raise prices to the consumer. Mr. Charles Merz (Great Britain) reviewed the development of the grid system in Great Britain, and suggested that while American conditions did not call for duplication of this system, many other problems of integration appeared to await solution in the United States.

Viscount Falmouth (Great Britain) predicted that private utilities would eventually be absorbed by the publicly owned units; this could only be brought about by national legislation. He stated that a definite position was being established resulting in lower rates to consumers.

The advocacy of publicly owned utilities to compete directly with private utility firms by a representative of the Mayor of New York City, let loose a flood of bitter criticism of State regulating bodies that force reductions in rates for the benefit of consumers. Incensed by assertions that only the threat of public ownership would force utility companies to reduce rates, the spokesmen of three American private companies declined to participate any longer in the sessions of the Conference.

With the failure of the representatives of American companies to answer the barrage of criticism, the defence of the cause of the private utility rested mainly with Mr. John C. Dalton (Great Britain), who appealed to the conference to keep politics out of the conference. Later on a spokesman for the United States Administration submitted an apology, deploring the introduction of politics into the conference.

Five more Americans scheduled to speak at the Thursday session withdrew from the day's discussions of Government utility policies. Their withdrawal came soon after Major-General Edward M. Markham, session chairman, had demanded that "politics, controversial matter and advertising," be excluded from the discussions. Six foreign speakers afterwards discussed strictly technical phases of coal and water conservation.

The need for greater national co-operation to meet the complexities of modern dam construction, especially the problems of special cements, was emphasised by speakers at the Congress on Large Dams.

The Banquet

The Conference banquet, held on September 10th in the great Union Station at Washington, the only place in the city big enough to accommodate so large a crowd, heard speeches by three distinguished Americans.

Mr. Floyd L. Carlisle, chairman of the board of the Consolidated Edison Electric Co., made an appeal for co-operation between the Government and the public utility industry to the end that the industry's problems might be solved without threats of competition from municipally owned and operated plants. The Secretary of the Interior, Mr. Ickes, stressed the need for lower rates by private companies to make electricity available to everyone. Another speaker was Mr. Owen D. Young, chairman of the board of the American General Electric Company.

In a paper prepared for the Conference, Mr. Hudson W. Reed, of the United Gas Improvement Company, asserted that "political expediency and enthusiastic experimentation" were involved in the programme of the U.S. Government for rural electrification. Mr. Reed's attack preceded the address to the Conference by President Roosevelt, when, in a ceremony arranged for the President's mid-afternoon appearance before the delegates, he pressed a button starting the Boulder Dam turbines.

Federal Power Commission officials declined to comment on published reports that the President was considering a co-operative pooling of the power developed by the Tennessee Valley Authority and the private utilities in the south-east, although in one of the papers submitted Mr. Basil Manly, vice-chairman of the Federal Power Commission, had proposed regional pooling of Government and private power under a Federal agency.

Rural Development

The session on farm electric service closely scrutinised the experiences of a dozen countries in promoting rural electrification. Delegates agreed in terming rural electrification a powerful factor in overcoming the drift of rural population to the cities, and centred their attention on ways and means of spreading its benefits. Foreign delegates stressed the fact that their Governments had taken a hand in the promotion of rural electrification and reported proportions of electrified farms ranging from 50 per cent. in Sweden to as much as 98 per cent. in Holland. It was pointed out that less than 12 per cent. of American farms had central station service.

At another session Mr. Philip Sporn, vice-president of the American Gas and Electric Co., attributed the failure of early rural electrification attempts in the United States to the sys-

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Problem of Design

I wonder how many manufacturers of domestic electrical appliances ever give serious thought to the vital matter of design for to-day? After a perusal of various manufacturers' catalogues, I am inclined to conclude that they have been studying the design of yesterday and, suddenly awakening to the fact that to-morrow is nearly here, are falling over themselves in a blind endeavour to get up to date!

At the mention of "modern design," they will proudly point to a shape that is either crazily "cubistic" and without rhyme or reason, or else something that is a compromise between early Tudor and the "shape of things to come"! The fact that seems to have escaped their notice or else has been unable to penetrate the conservatism of so many of them is that domestic appliances should be designed first and foremost for utility and fitness for modern conditions!

When they and their designers awake to the realisation of the needs of to-day—when their products are manufactured for the demand of to-day and designed to forestall the trend of to-morrow, instead of being as many are, four and five years, and even more in some cases, behind the times—then will they be utilising to the full the advantages of the most wonderful of modern developments—electricity! D. MILLS.

Harborne, Birmingham, *September 15th.*

Why Standardised Tariffs?

In the correspondence on this subject which followed my letter published in the ELECTRICAL REVIEW of August 7th, one very important point seems to have been overlooked—the necessity for every part of the system to contribute its quota to the yearly balance-sheet. In the past electrical men thought chiefly of load factor, and they sometimes believed that if this was right, all was right.

About thirty years ago I put forward the idea that the cost of distribution per unit sold was an even more important item. This I then called "density factor," but later I named it "distribution factor," and I believe that the use of this in statistics would be of great value to-day. The idea is that all yearly charges incurred beyond the switchboard, including labour, establishment charges, rates and financial charges, should be divided by the kWh sold, and the resulting figure would be the "distribution factor" for that undertaking. In many cases the value of this would indicate the difference between one undertaking and another, as one would be found to be selling a large amount of energy compared with its distribution costs, while another would be selling less on the same basis.

To-day bulk supply costs are low but distribution costs are often high. This is particularly the case in prepayment meter districts where lighting rates only are in use. It was recently reported that a town was to take legal action against consumers who were using heating-rate energy for wireless sets, but this is a doubtful policy. Every yard of mains laid, every service and every sub-station are sources of continual expense which is going on all the time, and it is the business of an undertaking to do everything possible to see that every effort is made to keep on selling cheap electricity for as many hours as possible in every district. Otherwise, some of the areas may be losing money although the results for the whole undertaking may be satisfactory.

To sell electricity abundantly in all areas to all classes of consumers it is necessary to devise tariffs to suit. There is still room for effort and ingenuity in this direction, and managers need not be discouraged by the criticisms of those at the head of the industry from trying to invent tariffs which will make every part of the system profitable, or at any rate prevent some parts from being a burden on the rest of the area. VARIETY.

September 16th.

Electrical Fatalities

Your correspondent "Cairngorm" certainly condemns the guilty party. Why mount a board and cut-outs between the piers of a scullery sink, or in a lavatory adjoining a washhouse? Probably to save the expense of a few yards of cable. Why blame contractors for the corporations' assisted wiring schemes? The corporation should know the type of work which is done for it. It usually accepts the lowest tender, very often at a ridiculous figure; commonsense should know that it is impossible to get a good job and good material at some of the prices which are accepted.

Who is to blame for contractors making a slip-shod job—unless they are well-established? Who cuts wiring prices so that an electrical contractor can barely get a living? Who can be as slip-shod as they please without even bothering about a "Megger" test? Who can earth a 75-kVA transformer with 7/20 wire?

Any good electrical contractor can provide an installation which is shockproof and foolproof, but at what price? So long as there are cut-throat conditions existing in the electrical world few will pay to have safe installations.

The N.R.E.I.C. is working with the Electrical Contractors' Association and doing all in its power to improve matters. May I suggest that the house which requires putting in order is that of the supply authorities?

I agree with "Cairngorm" that legislation is necessary, but commence the cleaning up in the correct place.

September 14th. ENGINEER.

I sincerely hope that Mr. Milne will not lose heart in his efforts to bring about compulsory registration and/or inspection, for there are far more people interested in the matter than he appears to imagine.

Perusing reports of inquiries into electrical fatalities, we find coroners making remarks such as "This atrocious state of affairs," "It is beyond my comprehension that unauthorised persons are permitted to make electrical connections," &c. Again, the president of the Institution of Fire Engineers in his address at last year's conference, laid particular stress (from a fire hazard point of view) on this very same subject. It is evident then, that we are not alone in our "worthy efforts" as Mr. Milne suggests, and I am sure that if he can prevail upon his M.P. to "catch the Speaker's eye" in the House again, he will receive better support than hitherto.

I am convinced that the time is not far distant when conditions on the installation side of the industry will be similar to those to be found in New Zealand. JOHN F. BRIDGE.

Accrington, *September 19th.*

The Control of Power Resources *(Continued from previous page)*

tem of applying suburban distribution methods to rural areas.

President Roosevelt's address was a plea for a more abundant life in this power age. A greater use of electricity, he declared, was absolutely essential in every sector, urban and rural, throughout the world, and its consummation depended on a "sound and courageous public policy." Referring to the United States, he said that notwithstanding reductions in rates and increase of consumption, there was a "vicious circle" in the electrical industry which must be broken. Federal power projects already completed might be the force needed to break the circle, he said, and if it should prove they were not sufficient "the influence of additional meritorious projects awaiting development could be added."

At the final technical session M. Max Frederick Horn urged the establishment of a permanent committee of ten or twelve unbiased experts to draw up rules defining the fundamental conditions on which utilities could best serve the general interest for the guidance of authorities. He also suggested that the committee might arbitrate on questions arising between authorities and franchise holders.

Mr. G. P. Brailo, chairman of the U.S.S.R. delegation, said that the first plan for the electrification of the U.S.S.R. was worked out in 1920 when only 520 million kWh was being produced annually. In 1935 the U.S.S.R. had actually produced 25.9 milliard kWh, and this year the output promised to reach 32.0 milliard.

The closing session of the Conference heard the remarks of Dr. Julius Dorpmueller, retiring president of the Conference, and elected Dr. William F. Durand, the eminent Californian engineer, as its next president.

About 400 of the delegates who attended the conference joined in a tour of industrial centres and power plants in the United States and Eastern Canada. Their first step was in New York City, where they were guests of honour at a dinner given by the Consolidated Edison Company. Following this they left at once for a day each at Montreal, Ottawa and the Niagara Falls; then by way of Chicago to Fort Peck, Montana; Seattle, Washington; the Grand Coulee, Bonneville Dam, Portland, San Francisco, the Grand Canyon of the Colorado, and, on the return trip, the Tennessee Valley. The tour is scheduled to end at New York City on October 6th.

Reuter's Trade Service Special.

Reducing Building Costs

THE growing appreciation by builders of the considerable savings in constructional costs effected by erecting all-electric houses is resulting in more than usual interest being taken in the Electrical Section at the Building Exhibition now being held at Olympia, London. Generally speaking, the economy effected by the elimination of flues and chimneys is sufficient to pay for the cost of the electrical installation with something to spare for the purchase of appliances. This fact, together with other attributes of electricity such as cleanliness, reduction of labour, and health considerations, is emphatically pointed out at the stand of the British Electrical Development Association which is responsible for the arrangement of the Electrical Section.

An improved washing machine fitted with a circuit-breaker and large enough for 10 lb. of dry clothes, thermostatically controlled cookers and water heaters, and coal effect and inset fires are items shown on the English Electric Co.'s stand, part of which is set out as a model kitchen designed on the most up-to-date lines.

"Osira" colour lighting is used very effectively for decorating the General Electric Co.'s comprehensive exhibit, which makes a special feature of the "Home Series" cookers with

The Waitaki hydro-electric power house and dam, South Island, New Zealand. The station has an initial capacity of 30,000 kW, but provision has been made for a total of 75,000 kW

coloured finishes and 4-heat hotplate control, new types of thermal storage water heaters, convector units, portable and inset fires, internal telephone systems and installation materials of every kind; an ironclad switchboard made by the company is used as a centre-piece and controls the lighting and power load on the stand.

The new "90J." table model cooker specially designed for small flats is among an attractive exhibit of cookers, fires and water heaters shown by the Jackson Electric Stove Co., Ltd., while Aidas Electric, Ltd., is drawing special attention to the best methods of fitting "Sadia" electric water heaters. Inset and corner fires shown by Messrs. Belling & Co., Ltd., are available in an attractive range of finishes including the "Neumode" imitation marble, a heat-resisting synthetic enamel.

In addition to the latest types of "Magicoal," "Haloberry" and other fires, Messrs. Berry's Electric, Ltd., are displaying water heaters, lighting fittings and "Coldspot" refrigerators. The last-mentioned also appear on the stand of their importers, Searsint, Ltd., which company is also showing "Kenmore" washing machines and vacuum cleaners. Other types of refrigerators are exhibited by Kelvinator, Ltd.; Express Refrigerating Co., Ltd.; Zeros Sales, Ltd.; Craven Electric Co. ("Sternette"); and Utilities (London), Ltd. (who are also introducing convectors and air-conditioning plant). The "Oxywash" washing machine made by Universal Refrigerators, Ltd., makes its first appearance, while the "Little Friend" dishwashers and drying cabinets are demonstrated by Newmectric, Ltd. Electric hot-water radiators are shown by the Warmo Heating Co. and also by Messrs. Morris Heating Appliances, Ltd.

Besides many manufacturers of electrically operated woodworking machinery the following are exhibiting other items of electrical interest:—Reliance Telephone Co., Ltd. (intercommunication and loudspeaking telephone systems, luminous and other signalling apparatus); Smith's English Clocks, Ltd.; L. G. Hawkins ("Sunray Tricity" fires, "Supreme" washers, "Finray" lighting fittings, &c.); Concrete Vibration, Ltd. (electric vibrators); Precision-Electric, Ltd. ("Radiomant" combined electric fires, radio receivers and clocks); Radio Furniture and Fittings, Ltd. (radio installation equipment); Kurt Erlach, Ltd. ("Volspray" painting equipment); Mansions Motor Co., Ltd. ("Kango" electric hammers); Slate Slab Products, Ltd. (inset fires and surrounds); A.C.E. Machinery, Ltd., and E. P. Allam & Co., Ltd. (hoists); Flextol Engineering Co., Ltd., and British Equipment Co., Ltd. (electric tools); Hope's Heating and Lighting Ltd. (automatic stokers); Standard Range & Foundry Co., Ltd. (coal-electric fireplaces); Hammond & Champness, Ltd. (lifts); G. A. Harvey & Co. (London), Ltd. (heater casings); London Sand Blast Decorative Glass Works, Ltd. (decorative glassware and signs); British Oxygen Co., Ltd. (welding equipment); Pilkington Bros. ("Armourplate" glassware); Aerostyle, Ltd. (portable paint spraying equipment); and Rawlplug, Ltd. (fixing devices).

In one of the exhibits arranged by the Department of Scientific & Industrial Research visitors are enabled to test the efficiency of various methods of reducing noise. The exhibition continues until next Wednesday.

In the Courts

ON September 17th the Inverness and District Valuation Appeal Court upheld the assessor's increased valuation—from £1,600 to £6,767—of the British Aluminium Company's hydro-electric works at Foyers, Inverness-shire. The assessor's contention was that the contractors' principle was applicable to the Foyers works as in the case of the recently erected works of the company at Lochaber. The company maintained that the principle did not apply, as the works had been in existence for forty years, and that for the past twenty-six years the valuation had stood at £1,600. An engineer stated that the plant and machinery at Foyers, in their present condition and situation, were unlettable to anyone other than the owners. The cost of erecting works to-day would be about 50 to 70 per cent. greater than forty years ago. Mr. H. A. Skelton, manager of the Foyers works, stated that the scheme was not at all comparable to Lochaber. It was problematical whether small works like Foyers could be kept going if additional burdens were to be placed on them. Mr. E. S. Morrison, the company's factor at Kinlochleven and Fort-William, said that the works were becoming obsolete and unlettable, and the valuation ought rather to be decreased. The Assessor said that the Appeal Court in Edinburgh had ruled that the contractors' principle was applicable to hydro-electric works, and he accordingly applied it to Foyers. An agent for the company said that the contractors' principle was merely a rough-and-ready rule-of-thumb method. The Court upheld the assessor's valuation and dismissed the appeal, and the company's agent asked for a stated case for the opinion of the Court of Session.

Organised Theft of Electricity

Allegations that there were persons going round the town offering to alter the electrical installation in houses so that householders received electricity for nothing were made at South Shields Police Court last week when ten householders were accused of fraudulently abstracting electricity belonging to the Corporation. It was stated that by means of this fraud the Corporation electricity undertaking was losing between £4,000 and £5,000 a year. It was explained that the method of defrauding the Council was the same in each case: a piece of wire was used so that electricity did not pass through the meter, and was therefore not registered. Charges against one or two of the defendants were adjourned, another defendant was cautioned, and the remainder were fined sums ranging from 10s. to £1.

Stolen Vacuum Cleaners

In the course of a case at Ealing Police Court last week it was stated that 2,000 machines had been stolen this year from the Hoover factory, Perivale. Three employés of the works, together with six others, were charged with the theft and receiving of vacuum cleaners. Two of the employés were sentenced to four months' imprisonment with hard labour and two others to six months' hard labour for receiving the machines. Four men were acquitted and another, who had stolen one machine, was bound over.

Wanton Interruption of Supply

At Bottisham, Cambridgeshire, last week a youth was summoned for "causing the wastage of electricity belonging to the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co." It was stated that he threw a piece of wire over some 33-kV lines "to see what would happen." As a result there was an interruption in the supply to Newmarket and Burwell, while several patrols were put to the inconvenience of inspecting the lines for some hours in an endeavour to trace the cause. In binding the defendant over the chairman of the Bench reminded him that there was a maximum penalty for the offence of six months' imprisonment as well as a fine of £100.

Electric Heating Equipment

Some of the new season's fires

AT this time of the year manufacturers are introducing many new models. Indeed, we have received details of such a vast and varied number that it is only possible to review here a selection. No radical change in design is apparent, the modifications in the majority of cases being merely in the design of the frame, though more attention is being paid to the models priced at between ten shillings and a pound. Reflector types of fire are very much in favour and chromium plate is now almost universally accepted as the standard finish for the reflector.

Taking a general survey of the new models, we seem to notice a scarcity of imitation coal designs. There is, however, one exception, apart from the "Magicoal" fires recently described, and this is the "Xcelcoal" (illus.), put on the market by ELEXCEL, LTD., Victor Works, Broad Green, Liverpool, 14, employing a new fuel, moving flame and curling smoke effect, with 2-kW flat bar elements. Other introductions by this concern are the H.7387 reflector fire, and a flat bar fire of the radiant type incorporating a special guard so that when the fire is laid on its back, supported by a special strut, a kettle can be placed on it.

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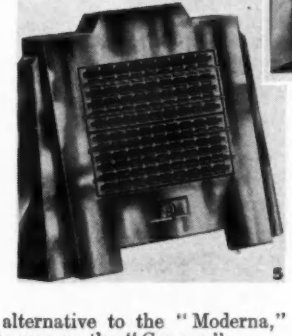
There are eight new fires by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2; three of them are robustly constructed, simple and low-priced flat-bar element models, two standard models, two of the simple reflector type (illus.), and a 2-kW model with two horizontal bar elements each with its own reflector. An interesting development is two models (flat-bar and reflector type) inset in a sheet-metal surround for fitting in the corner of a room.

Nine new models are listed by the REVO ELECTRIC Co., LTD., Tipton, Staffs. The "Wunbar" inset fire is now available loaded at 2 kW, and known as the "Tubar," and a new series of sheet-metal inset fires incorporating the "Hottabar" rod-type element in a parabolic chromium-plated reflector is known as the "Inca" with vertical elements, and the "Inlay" when fitted with horizontal elements. The "Outsette" (illus.) is similar, but is mounted flush on the wall; with flat-bar type elements this fire is known as the "Outbar." An inexpensive nickel-plated 600-W bowl fire is the "Sunray," while other newcomers included in this range of fires are a simple reflector unit (the "Ace"), a "Scroll" type screen fire, a simple cast-iron general-purpose model, the "Criterion" (illus.), the "Castle" radiant fire as an alternative to the "Moderna," and a series of portable fires known as the "Geneva."



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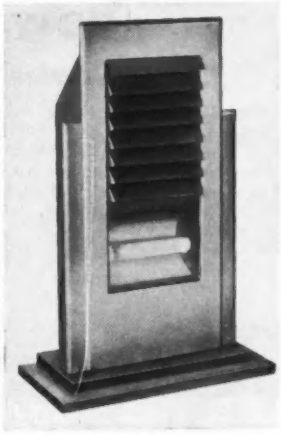
One of the most interesting of the new Belling fires (BELLING & Co., LTD., Bridge Works, Southbury Road, Enfield), is the "Oak," comprising a standard fire mounted and pivoted in a solid oak frame. The "County" (illus.) is an attractive sheet-steel example of a typical modern fire, while the "Pagoda" (illus.) strikes a novel note. Two "Converta" models have been developed to replace an ordinary coal fire, and the "Astoria" in a basic neutral colour is designed to stand against the wall or as a screen in front of existing fireplaces, a function which the new chromium-plated "Modern" fire will also perform. Grilles are used in the "Regal" and "Zephyr" models to enable a certain amount of convected heat to be obtained, lamps being employed to give a decorative effect.

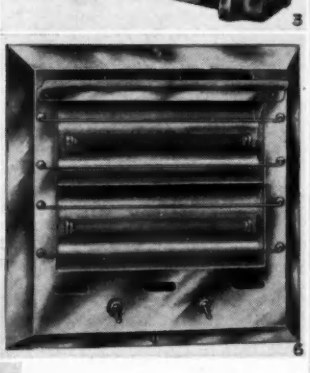
ELECTROWAY HEATERS, LTD., Sparrow Hill, Loughborough, concentrate on inset fires; a special method of construction enables the makers to claim a rise of only 100 deg. F. in the temperature of the top of the surround, thereby avoiding cracking. The "1B, 2R." (illus.) is a good example of the new inset models, and there is also a small sheet-metal design (No. 51) and a small adjustable reflector fire mounted on a cast-iron pedestal, the reflector of which can be set at any angle. Another vertical 1-kW inset reflector fire has also made an appearance, with a similar coloured model for flush fitting on walls and in corners.



The 700-W "Sunray-Tricity"

Four new "Sunray-Tricity" (illus.) combined convectors and radiators are being introduced by MESSRS. L. G. HAWKINS, 30-35, Drury Lane, London, W.C.2. Compared with last year's designs they have longer bases and the sizes of the louvres have been reduced. One, two or three 200-W radiant heat lamps are fitted and the elements (one or two) can be of 1¼ or 1½ kW. A 700-W model has been introduced and there is now a two-bar form of the "Paragon."

Included in the new range by the HOTPOINT ELECTRIC APPLIANCE Co., LTD., 24, Newman Street, London, W.1, are two 2-kW non-reflector portable fires (90 and 91) (illus.) of cast-iron construction and a high-quality inset reflector model (illus.) chromium plated with two clamp-in 1,000-W rod type elements. The No. 64 panel fire is also of cast iron and incorporates two independently switched 1-kW elements with separate parabolic reflectors. A 1-kW inset radiant fire (No. 85) has a hexagonal panel superimposed on the front of the main sheet-steel body. A modification of the company's "Puma" fire has been made so that it can now be obtained incorporating a prepayment meter above the reflector. The coin collector operates on a time basis, the gear ratio being automatically altered when the second fire element is switched on or off. There are several additions to the range of "Walglow" fires of WALSALL CONDUITS, LTD., Excelsior Works, West Bromwich, including the "Neptune" (illus.) a small, decorative yet low-priced cast-iron reflector fire, the "Venus" (illus.), a reflector model with provision for angle adjustment, the "Jupiter," a stable cast-iron reflector model, and the "Comus," a neat inset vertically disposed reflector model with a simple fixing method.



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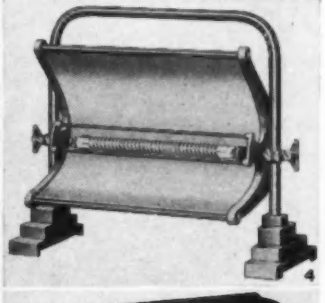

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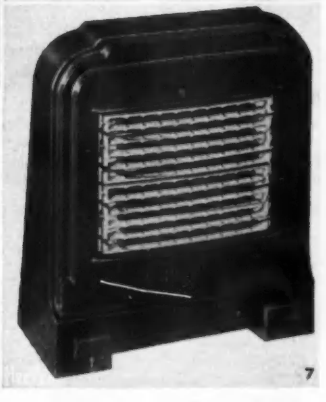

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New season's fires: (1) G.E.C. D.2703 reflector model; (2) "Xcel" imitation coal H.7383; (3 and 4) Walglow "Neptune" and "Venus"; (5 and 6) Revo "Criterion" and "Outsette"; (7) Hotpoint No. 90

The Jackson Electric Stove Co., Ltd., is, we are informed, retaining last year's models without alteration, while the modifications in the Ferranti fires have already been mentioned in these columns.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Bulpitt Domestic Appliances

Several novel appliances are included in the new "Swan" catalogue of MESSRS. BULPITT & SONS, LTD., Swansea Works, Birmingham, 1. There is, for instance, a combined kettle and saucepan with a two-heat element. A swivel handle is provided to allow the inner saucepan to be taken out and the lid fits both the saucepan and the kettle. Heat regulation is obtained by inserting in alternate positions the connector, which is marked "fast" and "slow." For aluminium and copper kettles a wooden handle is provided, but the nickel and chromium-plated models have handles of moulded bakelite.

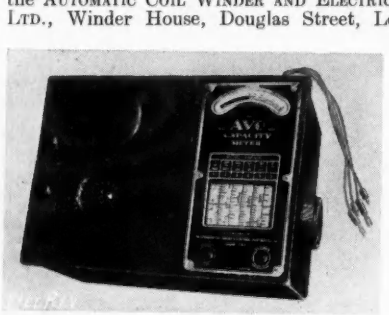
The "Swan" Devonshire cream scalder

The "breakfast set" is another newcomer; the toast rack is made to fit into slots on the top of the toaster to keep the toast warm, and a heavy chromium-plated tray prevents the crumbs from littering the table. There is also a low-temperature heater for cupboards, corridors, bathrooms, &c. It can be screwed to the floor or to the wall, and a chromium-plated towel-rail can be used in either position.

An interesting development is a Devonshire cream scalder. The boiler and stand are supplied in aluminium or copper, and the boiler is loaded with a "Swan" loop-type immersion element with a dual loading of 2½/1 kW. The scalding pan, which is of aluminium with bronze handles, is totally immersed.

Capacity Testing

For accurate laboratory work and mass production testing the AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD., Winder House, Douglas Street, London, S.W.1, has introduced an "Avo" capacity meter giving five ranges from 0 to 0.1 mF., with a visual indicator the total scale length of which is about 42 in. The sub-divisions on the scale between 0 and 0.0005 mF. are of 5 mmF., enabling accurate measurement of small capacities.

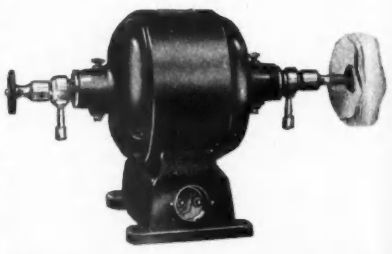


The "Avo" capacity meter

No external standards are needed as the reference condensers are accurately calibrated before assembly; they have a good power factor and have a negligible temperature coefficient error. Two adjusters are provided, one to compensate for variations due to changes in atmospheric conditions, capacity of connecting leads, &c., and the other to set full scale deflection on the indicating meter. The power for the meter is obtained from a 45-60 V battery and a 2-V accumulator, a four-way cable with a plug-in adaptor serving as a connector between the batteries and the instrument.

Polishing and Grinding Motors

Fractional horse-power motors for polishing and grinding, particularly for use in the dental and jewellery trades, are a speciality of MESSRS. MARELLI & CO., LTD., Artillery House, Artillery Row, Victoria Street, London, S.W.1. Recently a number of improvements have been carried out in the two-speed, single-phase model.

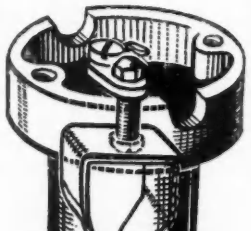


The latest Marelli polishing and grinding machine

The motor is totally enclosed. Two speeds of 2,800 and 1,400 r.p.m. are available, with output ratings of 1/5 and 1/10 h.p., the speed variation being obtained without a resistance or choke. The current consumption of a normal high-voltage machine is about ½ A at no load, 1 A at full load, and the momentary load on starting does not exceed 2 A.

An Architectural Lampholder

The COLLIER ELECTRIC CO., LTD., Colmac Works, Edwin Road, Twickenham has just introduced a new black bakelite holder for architectural lamps. The centre piece has on one side a loose sprung copper coupling which ensures good alignment of the holders after fixing and wiring, and on the other a brass screw terminal.



The "Collier" lampholder

Flameproof Fittings

Two new types of flameproof fittings have recently been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. An automatic plug type fitting comprises a solid metal casting housing an insulating plug through which connecting bus-bars are fixed. Two plug members of the 3-pin, straight-through type are fitted; these plug into the bus-bars. The plugs are so designed that the earthing core pilot plug is longer than the lighting plugs. Where the pilot system is used the pilot continuity is disrupted before the lighting plugs break contact with the sockets. The straight-through plugs enable fittings to be connected one to another, a special end plug being provided for each series of fittings.

The holder of a new handlamp is fitted to a collapsible platform which is spring loaded and so arranged that unless the protecting well-glass with its ring is replaced, the lamp cannot be lighted. The well-glass is protected by a strong cast guard.

New fires (see preceding page): An "Electroway" wall pattern; the Belling "Pagoda" and "County"; and a Hotpoint panel fire

The "Better Light—Better Sight" Campaign

ON Monday a conference of representatives of supply authorities, manufacturers, wholesalers and contractors, presided over by Mr. A. E. McKenzie, chief engineer and manager, Wimbledon Corporation Electricity Department, was held at the Lighting Service Bureau to discuss the national "Better Light—Better Sight" Campaign which the Electric Lamp Manufacturers' Association is carrying out this autumn in conjunction with the British Electrical Development Association and the Joint Council of Qualified Opticians. (The reasons for and objects of the campaign were dealt with in detail in an article by Mr. W. J. Jones, manager of the E.L.M.A. Lighting Service Bureau, in our issue of September 11th, page 335.)

Opening the discussion, Mr. V. W. Dale, business manager, E.D.A., stressed the need for the wholehearted co-operation of the electricity supply authorities and contractors. As announced in the programme (E.D.A. Publication 1354) national Press publicity would result in 70 or 80 million advertisements appearing in the newspapers during October and November, but this was not enough. Time was short and the campaign must be speeded up by local advertising (for which stereos were available) and by organising joint conferences between electricity supply authorities and local opticians. Six articles had been prepared for circulation to the local Press, and telling posters, charts and other publicity materials were now obtainable.

Mr. Dale hoped that supply authorities would avail themselves of the attractive folders and poster stamps produced for inclusion with accounts and correspondence and would put the "Better Light—Better Sight" display in their showroom windows whenever possible during the next two months, at any rate during the week commencing October 5th, which was the week chosen by the opticians to inaugurate their portion of the scheme.

Outlining the reasons which have led up to the campaign, Mr. W. J. Jones said that it was only in the last 50-100 years that the human eye had been called upon to adapt itself to read close printing indoors. The usual artificial light used was probably only one-two-hundredth of that of the daylight which would be chosen as the most comfortable for reading. Mr. Jones emphasised by lantern slides a few of the most important facts relating to the functioning of the eyes at various ages and under different conditions.

He said that he was amazed at the enthusiastic way in which the opticians were interesting themselves in the campaign. The J.C.Q.O. had sent to each optician in the country a showcard and counter display card and was going to take 13,000 poster sites. He suggested that opportunities should be provided in electricity showrooms for visitors to choose how much light they would like to have, and he urged that immediate steps should be taken to provide salesmen with light meters.

Left: The campaign window display. Below: Design for stamps and posters

Similar conferences have been, or will be, held at Birmingham, Bristol, Cardiff, Leeds, Manchester, Newcastle, Glasgow, Tunbridge Wells and Ipswich.

A visit last week proved to us that preparations are well advanced at the Lighting Service Bureau for the campaign.

As part of the electrical contribution to the campaign a talking film has been made in which Mr. W. J. Jones explains lucidly the necessity for more and better light.

Domestic Apparatus in Canada. By Viola Ripley

AT the Canadian National Exhibition, held in Toronto from August 28th to September 12th, a comprehensive range of domestic electrical appliances was shown, enabling a general impression of the trend of development in Canada to be obtained. To the English visitor the absence of electric fires is marked, but in many new houses open fireplaces are being provided and electric fires should increase in popularity. Many people have steam central heating, but like to keep their bedrooms cool and appreciate an electric heater for early morning warmth. Those seen were of the flickering type.

Coloured porcelain enamel finishes were shown on some kitchen equipment, but the vast majority were white. Experience shows that white is preferred by the British section of the community, while sales of coloured finishes are greatest among the French and Southern European sections.

The Canadian Westinghouse Co., Ltd., showed a new washing machine with a monel-metal top and square tub, fitted with a current overload trip switch. The water-pump hose is neatly stored in the body. "Apex" electric washers have a new gyrator, the "double-dasher," the vanes of which are twisted through 180 deg. in the form of a screw, which has the effect of raising and lowering the clothes in the water at the same time as revolving them.

Wringers are fitted with larger pressure-release handles of the push-bar-release type and the spinner-dryer, built on the same frame as the washer, is increasing in popularity. For safety, the cover of the "Apex" spinner-dryer must be closed before the control handle can be turned on. The "Apex" ironer has a balanced cover for convenience in handling, and the roller will stop rotating for pressing purposes. The General Electric Co. has introduced a new flat press ironer.

The new "Sunbeam" iron, of the light sole-plate type for quick heating, is provided with a two-position thermostatic heat control. The regulator is in the front of the handle, convenient for thumb operation. This iron has the usual plug and socket for the cord.

The absence of electric kettles is noticeable, particularly as new coffee percolators are shown. Most of the cookers shown had high-temperature hot-plates, and enamelled kettles were recommended. The "Sunbeam" coffee percolator is provided with two heats, one for making the coffee and the other for keeping it hot.

Time and temperature controls are fitted to baking ovens by Moffats, Westinghouse and the General Electric; "Economy" boiling rings are continued by the General Electric. These are well lagged and sunk into the stove top; they are provided with three loadings, one of about 660 W for boiling and two simmering loadings of 120 W and 100 W.

Refrigerators show smoother exteriors, with few excrescences, and in many cases storage racks are provided in the door.

Do Engineers Increase Unemployment?

The economics of invention

IN our last issue we made brief mention of a paper entitled "The Economic Incentive of the Engineer," which Dr. C. C. Garrard read before the Engineering Section of the British Association.

The author set out in this paper to refute the idea that the efforts of the engineer to reduce the amount of manual labour in the production of goods resulted in increased unemployment.

He was concerned mainly with the engineer as an inventor but his work as an organiser and manager was almost as important. If, owing to doubts of the ultimate beneficence of his efforts, the internal urge were weakened, his output would be seriously affected, and this accounted for the interest shown by engineers in forming circles to study economics.

We had been brought up in the idea that self-interest provided sufficient incentive to progress, but to-day things were very different. In modern industry the great bulk of development work and invention came from unknown men working in organised laboratories who agreed to assign all their inventions to their employers in return for a nominal sum. That this requirement was not resented was a sign of the professional zeal of their members. Hence it was of vital importance that they should not lose the enthusiasm and zest that depended upon the spirit of the worker; if this were damped, invention and scientific progress withered away.

The problem was fundamentally one of economics. Industry existed solely to provide men and women with more and more means of enjoyment, and economics told how this could most easily be done. Economics differed from other sciences in that it could only bear fruit by being applied by outsiders, including engineers. He asked the economist to help the engineer to base his practice on safe economic foundations.

What was the effect of the work of the engineer upon national income and upon the condition of employment? Was he, by continually striving to reduce human toil, simply increasing profits of shareholders at the expense of the unfortunate people whose economic position was undermined by his efforts?

National Income and Purchasing Power

The economic conditions of society always tended towards an equilibrium and the only thing any Government could do towards altering this equilibrium was to set up such conditions that the resulting economic equilibrium would be one in which full employment took place. That had been the underlying principle of the Soviet plan. The real national income was the money income divided by the price level of consumption goods. The inventor could increase this income either by increasing the money income or by decreasing the price of goods purchased by it. The assurance that his work would provide either of these results would be a real incentive to effort.

When a new industry was invented which provided new means of enjoyment, those who had previously spent all their incomes on maintaining the standard of living to which they had become accustomed suddenly started to buy the new things without diminishing the consumption of the other commodities. Prosperity was promoted by the new industry because it created the purchasing power upon which the demand for their products depended.

Mr. J. M. Keynes had shown that if money not spent on consumption goods was simply accumulated, then the national income would decrease in geometrical proportion. If however, this money was spent upon new productive forms of investment (invented by the engineer) then the national income was increased automatically by an amount equal to twice the value of the new goods.

The work of the engineer, Dr. Garrard believed, was mainly concerned with the reduction of the cost of production which was the denominator of the ratio which expressed the real national income. Reckoned upon industry as a whole, the cost of materials cancelled out, and all costs were made up of labour (including salaries) and profits. The only way costs could be decreased was by reducing the amount of labour necessary.

The Limit of Activity

In factories, the volume of production was what the factory could sell. It had been urged that men should share in the available work rather than that they should remain idle on a dole, the underlying idea being that work, by its nature, was limited and that the unemployed could not find useful spheres of activity elsewhere. The limit, however, was only that imposed by our failure to develop and invest. The only way open to the engineer (apart from his activity as inventor) was to reduce the cost of production. If the standard of living was to be raised, the cost of production must be reduced by eliminating labour which, apart from profits, was the sole constituent of cost of production. The solution of the paradox was a balanced activity of the engineer. As inventor he must provide new spheres of work for those whom he displaced from older industries and if he were allowed freely to develop along these lines the world need have no fear of the ultimate result.

Mr. C. C. PATERSON thought that shareholders' dividends found no place in the minds of those working in laboratories and large works. They felt that technical stability for their firm was necessary to enable them to work happily and to attain some of their ideals, but did they ask themselves whether they were doing good to the community? Thus, the suggested programmes for television made one wonder whether the hard work in devising apparatus had been worth while.

PROF. F. C. LEA said that even in South Yorkshire where labour had been displaced by the use of machinery in the coal mines, he considered it would be unwise to stop the trend, because he was convinced that the increased productivity as the result of the work of the engineer must in the long run put more men into employment. Increase of employment could only be brought about by properly utilising past savings in the development of new industries and so increasing the national wealth.

Power and Factory Output. By T. W. Fazakerley, A.I.I.A.

IN most manufacturing organisations to-day some form of budgetary control predetermines the estimated amount that will be expended on power for a given volume of output, and at the end of each quarter a statement is prepared showing the actual expenditure on power as compared with the estimated or budgeted expenditure, and the costs and overhead charges for the subsequent quarters are easily adjusted by the gain or deficit made during the preceding quarter.

This system of budgetary control is, of course, essential to-day, but from the power engineer's point of view it is preferable to have a more frequent statistical control of power costs and consumption, and I therefore suggest that this degree of control can be obtained by the application of the following method:—

In the first place it is assumed that on a given turnover the power consumption will be £x, and it is therefore a comparatively simple matter to subdivide this figure (*i.e.*, £x) into (a) the number of units to be consumed as a.c. and (b) the number of units to be consumed as direct current. By reference then to the h.p. value of the machines in each shop, combined with the wattage value of various lamps, it is possible to arrive at a power unit value for each section in the factory and therefore a certain value in units is debited to each section per week.

The illustration below shows a very simple form of power report in which the organisation is subdivided into various sections or rooms for this purpose. Against each section is entered weekly the budgeted quantity of units allowed for that section, and against this budgeted quantity is posted weekly the actual consumption. If the actual consumption is greater than the budgeted consumption, the only acceptable explanation is that the actual output is greater than the budgeted output. If the actual consumption is lower than the budgeted quantity and the output remains constant, it must be assumed that the budgeted quantity is incorrect, or that a greater output is being obtained from a machine per unit used.

SECTION.	BUDGETED QUANTITY OF UNITS.	ACTUAL CONSUMPTION.	PLUS.	MINUS.	EXPLANATION.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

A Scottish Co-operative Lamp Factory

On several previous occasions we have mentioned the proposal of the Scottish Co-operative Wholesale Society to establish an electric lamp factory. The directors of the Scottish C.W.S. have now decided to proceed with the scheme in conjunction with the Swedish co-operative movement. The latter will invest a third of the £60,000 capital required and there will be joint control. It is stated that an agreement is being reached between the directors and the Electric Lamp Manufacturers' Association of Great Britain under which there will be no undercutting of prices or unfair competition. The agreement will extend over ten years.

Next Year's Fair

A further important extension of the British Industries Fair buildings in Birmingham with an impressive new main entance on the north side, was decided upon at a meeting of the Fair Management Committee in Birmingham on September 21st. Mr. J. P. Plant, chairman of the committee, states that although they increased the exhibiting area by 27,000 sq. ft. for the 1936 Fair, they are now adding a further 12,000 sq. ft., bringing the total indoor exhibiting space to well over 300,000 sq. ft. Although the extension is nominally of the Building Section, there will be a general effect upon the rest of the Fair because certain firms which had booked temporarily in other sections will now move in and there will be more room all round. The provision of the long-desired central main entrance has an important bearing on the development of the outdoor section, the lay-out of which can now be finally determined.

Lighting Fittings Prices

The Decorative Section of the Electric Light Fittings Association has decided that the list prices shall be increased by 5 per cent. of all lighting fixtures, including their glass component parts, and on such fittings accessories as are detailed in Schedule 4 of the Fair Trading Policy, with the exception of industrial fittings as defined in the first four paragraphs of Category 1 and the whole of Categories 2 and 3 of Schedule 3 of the Policy. The increase is to be put into operation as and from October 1st. In addition to the members of the Association a number of outside firms have also intimated that they are willing and prepared to operate this increase, which has been necessitated by additional costs both of labour and of material which it has been found could not be entirely absorbed by the manufacturers.

New L.E.P. Showrooms

The new showrooms recently opened by the Lancashire Electric Power Co. at Ramsbottom and Whitefield are provided with well-equipped demonstration rooms and office accommodation. Before opening these showrooms the company experimented with the use of temporary shops for a few weeks at different periods and compared the results with alternative methods such as occasional exhibitions and the visits of its travelling showroom. In Whitefield and district the company has about 3,000 customers, representing about 90 per cent. of the premises in the district. Whitefield is practically a dormitory for Manchester workers and a large number of new houses has been erected in recent years. The district is still of importance, in addition, to the cotton trade and to other industries. The company also has about 3,000 consumers in Ramsbottom, representing about 70 per cent. of the premises. As this industrial township is dependent upon a variety of industries besides cotton, it has suffered less than many other Lancashire towns, and only about 8 per cent. of its insured workers are unemployed.

Pumping Plant Troubles at Tir John

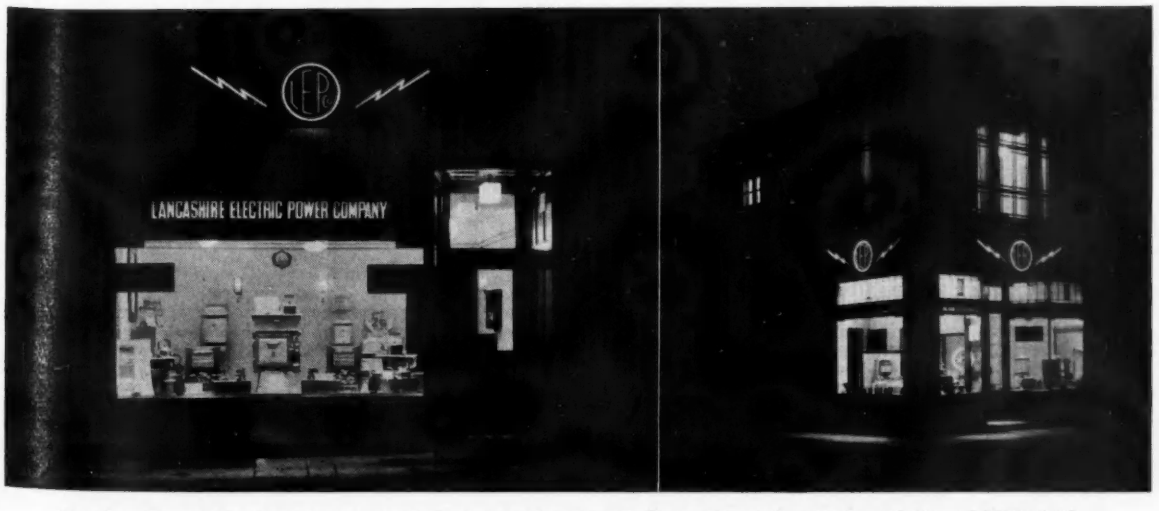
The Swansea Borough Council decided last week to hold a special meeting for the purpose of discussing the question of unsatisfactory plant at the Tir John power station. It was also agreed that the borough engineer should prepare a report on the station. Ald. E. Harris said that a report submitted to a sub-committee showed that things were wrong in a number of instances. The Electricity Committee reported that it would be necessary to replace the existing eight pumps which had been installed in connection with the washery plant. The contractors were installing two new pumps at their own expense on condition that in the event of the pumps working to the satisfaction of the borough engineer the Corporation would pay for them and also for six additional pumps. The total cost of the eight new pumps would be about £4,500. The report concluded by stating that £2,000 had been spent on the existing pumps above the initial cost, and that it would be necessary to spend a further £1,000 on them pending their replacement. The Mayor (Coun. A. R. Ball), who is chairman of the Electricity Committee, said that the consultants (Messrs. Preece, Cardew and Rider) had explained that the station was an entirely new venture. Consequently the contractors had no previous experience to guide them, and had not reckoned on the fact that, as was actually the case, erosion would take place in the pumps through the presence of certain solids in the water. The committee's point of view, the Mayor went on to say, was that obviously if the present pumps were unsuitable the sooner they were changed the better. The responsibility could be investigated afterwards.

Yugoslavian Electrical Imports

Imports of electrical machinery and apparatus into Yugoslavia last year showed an increase on 1934 of about 10 per cent. in value, the total being 108,600,000 dinars as against 99,900,000 dinars (dinar varies between 200 and 250 to £). Of the 1935 total about one-fifth consisted of generators and motors, Germany being the leading supplier, with Austria fairly well represented and Great Britain having also a moderate share. Other electrical imports from the United Kingdom during the year were:—Accumulators (230,000 dinars), cables (260,000 dinars), circuit breakers, starters, etc. (300,000 dinars), and wireless material (1,634,000 dinars). With regard to the last item it should be said that it represents only one-tenth of Holland's participation in the radio trade of Yugoslavia. Germany continues to strengthen her hold on the import market generally. Great interest has been taken for a year or more in the manufacture of radio receiving apparatus in Yugoslavia. In Belgrade a factory has been started by an existing metal-working concern and another by Philips, while in two other towns manufacture is also planned.

Orders Recently Booked

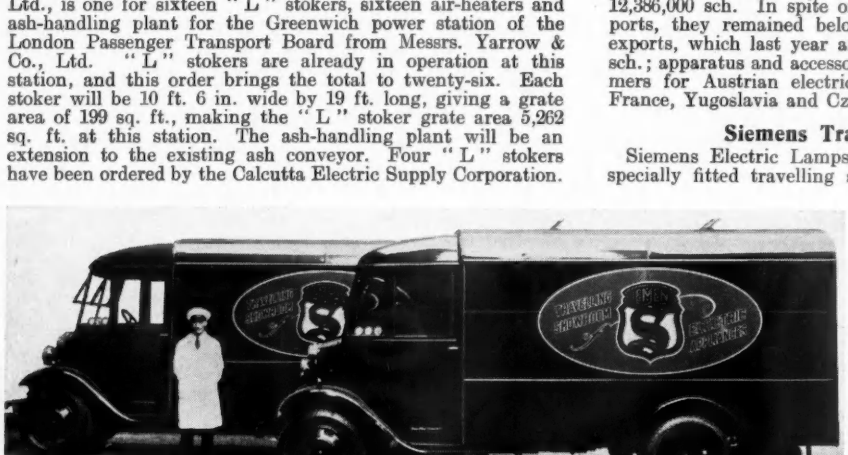
Messrs. Crompton Parkinson, Ltd., have secured a contract for the electrical equipment of the new mill at Warrington for the Thames Board Mills, Ltd. This order covers



Exterior views of the new showrooms of the Lancashire Electric Power Co. at Ramsbottom (left) and Whitefield

high and low voltage switchgear and transformers for the power station, with motors for driving auxiliary plant. The mill equipment will consist of specially designed high and low voltage truck-type cubicles, power transformers and lighting transformers. In all there will be about sixty high-voltage motors of 100 b.h.p. and upwards, the majority of these machines being of the Crompton patented auto-synchronous type. Other machines will comprise slip-ring motors, direct current variable speed motors, and the whole of the motors for about twenty-seven cranes. In most cases the motors will be of hose-proof construction.

Among recent orders received by International Combustion, Ltd., is one for sixteen "L" stokers, sixteen air-heaters and ash-handling plant for the Greenwich power station of the London Passenger Transport Board from Messrs. Yarrow & Co., Ltd. "L" stokers are already in operation at this station, and this order brings the total to twenty-six. Each stoker will be 10 ft. 6 in. wide by 19 ft. long, giving a grate area of 199 sq. ft., making the "L" stoker grate area 5,262 sq. ft. at this station. The ash-handling plant will be an extension to the existing ash conveyor. Four "L" stokers have been ordered by the Calcutta Electric Supply Corporation.



The new travelling showrooms of Siemens Electric Lamps & Supplies, Ltd.

These will be of the twin type, each 17 ft. 6 in. wide by 22 ft. long, giving a grate area of 385 sq. ft.

Employment in August

Employment during August in the engineering industry showed little general change and remained good in electrical engineering. *The Ministry of Labour Gazette* states that the total out of work in the engineering industry as a whole was 77,462, which was slightly lower than in July and 33,734 below the figure for August, 1935. In the electrical engineering section the number of unemployed was 3,768, the percentage falling slightly from 4.1 to 4 (6.2 per cent. in August, 1935). The unemployed in the electrical wiring and contracting industry numbered 4,522 or 12.8 per cent., as compared with 14.2 per cent. in July and 15.8 per cent. in August, 1935. In the electric cable, apparatus and lamps, &c., group the number of unemployed was 7,755, the percentage falling from 6.1 to 5.5 (6.7 in August, 1935).

Industrial Plant Exhibition

An exhibition and demonstration of welding plant and rods, industrial rectifiers and rectifiers for battery charging, condensers for power factor correction, "Philora" sodium and mercury electric-discharge lamps, industrial X-ray apparatus, &c., is being organised by the Clyde Valley Electrical Power Co. and is being held in conjunction with Messrs. Clarkson and McGregor, the Scottish agents for Philips Industrial, at 12, Bothwell Street, Glasgow, C.2, from September 30th to October 7th (daily from 11 a.m. to 8 p.m., Saturdays 10 a.m. to 5 p.m.). A lecture will be given by Mr. C. H. Dye on September 30th at 7.30 p.m. in the Stow College on "New Developments in Arc Welding Plant," and a film on welding will be shown.

Social Events

A new branch of G.E.C. social activities is the Horticultural Society formed this summer, with Mr. H. C. Wilson as the first chairman. The initial show of members' fruit, flowers and vegetables was held at Magnet House, Kingsway, W.C., on September 15th.

A Carnival Tableau

Mr. C. Barrett, sales superintendent with the West Hampshire Electricity Co., Ltd., has sent us a photograph of a "Mazda" tableau with which his company obtained first prize at the Romsey Hospital Carnival held on September 16th.

The "Model Engineer" Exhibition

The Lewisham Gaumont Palace with complete electrical stage lighting equipment, a pair of rotors for a model Ljungstrom turbine, an electric rotating chart board, and a trickle charger, not to mention numberless electric trains and boats, are among the subjects chosen by exhibitors at the "Model Engineer" Exhibition now being held at the Royal Horticultural Hall, London, S.W.1. The standard of workmanship displayed reflects the patience and ingenuity of the exhibitors, who often have had only very limited equipment and tools at their command. Among trade exhibitors who have products on view are Mek-Elek Engineering, Ltd. (adjustable lighting units); Desoutter Bros., Ltd. (electric drill guns); Shenphone Electrical Products (model railway power units); Queen's Engineering Co., Ltd.; and E. P. Allam & Co., Ltd. (electric motors); Research Engineers, Ltd. (scale models, including radio valve three times full size); and M.P.R. Electrical Co. (battery chargers).

Austrian Electrical Imports and Exports

Imports of electrical machinery, apparatus and accessories into Austria showed an increase of 20 per cent. last year as compared with 1934, the aggregate value being 18,268,000 schilling (25 sch.=about £1), of which Germany's share was 12,386,000 sch. In spite of this fairly substantial rise in imports, they remained below the level of Austrian electrical exports, which last year amounted to:—Machinery, 6,305,000 sch.; apparatus and accessories, 21,882,000 sch. Leading customers for Austrian electrical goods were Rumania, Poland, France, Yugoslavia and Czechoslovakia.

Siemens Travelling Showrooms

Siemens Electric Lamps & Supplies, Ltd., is again using specially fitted travelling showrooms for displaying a representative range of its electrical appliances. These cars are touring Great Britain, calling on all classes of the trade in all the large towns, accompanied by special representatives, enabling customers to see at first hand the company's latest fires, tube heaters, water-storage heaters, cookers and a comprehensive range of other appliances, including irons, kettles, saucepans, &c. The accompanying illustration shows the cars prior to starting their journeys.

The Proposed Factories Bill

The Labour Correspondent of *The Times* states that in view of the Government's promise to introduce a Factories Bill during the next session of Parliament a "Campaign Committee" has been formed with the object of ensuring an adequate Bill. One of the objects is to secure a new statutory limitation of the working hours of women and young persons. It is pointed out that the last consolidating Factory Act was passed thirty-five years ago. Since then there has been a succession of supplementary measures governing factory and workshop conditions as well as a considerable number of statutory regulations and orders.

The Grocers' Exhibition

An excellent example of how electricity can be used for lighting and heating provision shops has been arranged by the Edison Swan Electric Co., Ltd., at the fortieth International Grocers' Exhibition now being held at the Agricultural Hall, Islington, London. Well-diffused lighting of a high intensity is provided in the interior by "Harlite" pendant fittings, while "X-ray" reflectors are employed for the windows; both types of fitting are supplied by Messrs. Harcourts, Ltd. The economy of electric heating is demonstrated by a typical installation by Space Heating, Ltd. For the 400 sq. ft. floor space in the model shop a combination of "Xcel" (Elexcel, Ltd.) wall panels, skirting panels and tubular heaters has been employed with a load of 5.6 kW. Thermostatically controlled and fitted with a time switch (British Sangamo), the installation costs would be in the neighbourhood of £33 and the maintenance costs about £12 per annum, with electricity at ½d. per kWh. A special type of tubular heater keeps the window glass free from steam. Other electrical equipment

Counter showcases in Messrs. Selfridge's Hosiery Department, effectively illuminated by "Mazda" light tubes concealed in special trough reflectors.

shown at the exhibition is largely concerned with weighing and packing, among the principal exhibitors being the Automatic Weighing and Packing Co., Ltd.; Southall & Smith, Ltd.; Albro Fillers & Engineering Co., Ltd.; "Beth" Label & Wrapping Machines, Ltd.; Akurat Sugar Machine (Sales) Co.; and Stanley Machine (Sales) Co. A 1-h.p. direct drive coffee mill capable of dealing with 3 lb. a minute is the latest addition to the Uno Co.'s range of coffee machinery which includes electric roasters. The "Xcedale" electric raisin stoner is demonstrated by Messrs. J. Collis & Sons, Ltd., while Messrs. Berkel & Parnall's Slicing Machine Mfg. Co., Ltd., is introducing new electric bacon slicers. "Rapid" sifters, mixers and dryers of many different types are to be seen on the stand of Messrs. Wm. Gardner & Sons (Gloucester), Ltd., and demonstrations are given by "Saffa" of candling, grading and packing eggs under the National Mark Scheme. The Burroughs Adding Machine, Ltd., and the National Cash Register Co., Ltd., both show electrically operated machines. The advantages of the "Metrovick" electric delivery van are pointed out by Messrs. P. W. Taylor. The Maryland Engineering Co. has a number of electrically operated signs specially suitable for Christmas and Coronation displays. The exhibition closes this evening (Friday).

Business Humour

A little light relief in the routine of business is often welcome. Messrs. Bulpitt & Sons, Ltd., have sent us a copy of the following playful letter recently received by them:

"Dear Sir,—Would you please put a new element in my 'Swan Brand' electric kettle and what is the price of repair? The kettle went wrong, and my brother-in-law told my wife he knew just what to do, so she gave it him to take home and repair; well he should know, he is a milkman. He brought it back in pieces, but if you can repair it will you let me know please and I will send the ring part in to you. It was under guarantee, but naturally that is broken.

"All I hope is that his milk turns sour, and the next cow (or wherever he gets his milk from) he sees, fuses up and causes a short.—Yours truly."

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. September 23rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
b Babbitts Metal and Anti-friction Metals—		
f Grade I ... ... per ton net	£184	£7 inc.
f Grade II... ... ... ,,	£128	£3 inc.
Grade III ... ... ,,	£69	£2 inc.
Brass (rolled metal 2" to 12" basis) per lb.	7¾d.	¼d. inc.
,, Tubes (solid drawn) ... ... ,,	10d. to 10¼d.	¼d. inc.
c ,, Wire, basis ... ... ,,	8d.	¼d. inc.
c Copper Tubes (solid-drawn)... ... ,,	11d.	¼d. inc.
c ,, Bars (best selected)... ... per ton	£72	£2 inc.
c ,, Sheet... ... ... ,,		
f ,, Rod ... ... ,,		
f ,, (Electrolytic) Bars ... ... ,,	£43 10s.	—
f ,, ,, Wire Rods ... ,,	£49	—
d ,, ,, H.C. Wire ... per lb.	7¾d.	—
d Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
d ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	10¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£20 10s.	10s. inc.
g Mercury ... ... per bot.	£12 7s. to £12 17s.	—
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e ,, ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	1/-	¼d. inc.
p ,, ,, rolled strip & sheet ,,	11¼d.	¼d. inc.
p ,, ,, wire ... ... ,,	1/0¼d.	¼d. inc.
o Platinum ... ... per oz.	£14	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter... ... ... per ton	£14 1s. 3d.	8s. 9d. inc.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£198	£6 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Belgian Foreign Electrical Trade

The following table shows the Belgian imports and exports of electrical machinery, apparatus and cognate goods during the first half of the current year as compared with the corresponding six months of 1935, the values having been converted at the new parity rate of 143¼ fr. to the £. It will be seen that both sections of the trade—imports and exports—show a marked improvement, imports having advanced to the extent of £81,799 and exports by £236,871:—

	Imports. Jan.–June.		Exports. Jan.–June.	
	1935.	1936.	1935.	1936.
	£	£	£	£
Dynamo-electric machinery	156,145	172,140	60,810	63,170
Dry batteries	7,296	7,101	404	641
Accumulators and parts	8,300	4,425	6,890	8,634
Magnets, other than electro magnets...	2,885	8,007	—	49
Land and submarine cables	4,070	4,836	73,303	115,400
Insulated wires and cables	31,652	42,062	72,425	135,124
Carbons and electrodes	13,833	26,049	84	111
Porcelain insulators	4,941	4,928	1,561	1,331
Electric globes, lamps and glassware...	20,697	26,843	17,986	27,450
Insulating tubes, junction boxes, etc....	14,927	12,836	4,711	6,955
Other insulating material	9,972	9,805	725	2,155
Arc lamps	378	453	—	14
Incandescent lamps	56,202	58,411	30,265	41,784
Radio valves	88,592	81,164	2,042	5,910
Electric measuring instruments ...	56,258	67,087	2,014	5,847
Telegraphic and telephonic apparatus	13,247	16,355	246,201	301,338
Radio sets and apparatus	132,550	94,676	31,802	64,467
Other electrical apparatus	396,836	463,352	52,523	60,237
Totals	£1,018,781	£1,100,530	£603,746	£840,617

Trade Announcements

The Hotel Automatic Machine and Engineering Co. are now operating at Regent House, 38/40, King's Road, Reading, as general electrical engineers, with Mr. G. W. Spencer as managing director, and they ask for manufacturers' lists.

The sale of time switches previously handled by the Stonebridge Electrical Co., Ltd., is now being conducted by Time Switches & Instruments, Ltd.

The telephone number of the London office of the Pirelli-General Cable Works, Ltd., has been changed to Euston 3131.

The Universal Lighting Co., electrical engineers and contractors, has opened larger premises at the corner of High Street and Station Road, Clacton-on-Sea.

New Catalogues and Lists

Simplex Electric Co., Ltd., Credenda Works, Oldbury.—Two leaflets describing the "Reflecto-flood" open-type projector and other floodlighting equipment.

British National Electrics, Ltd., Newarthill, Motherwell.—A new season's fire catalogue.

Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester.—Publication No. 125 illustrating profusely and describing the "Keepalite" emergency lighting system.

Veritys, Ltd., Plume and Victoria Works, Aston, Birmingham, 6.—A technical booklet, including performance graphs, dealing with the company's high-torque motors.

M. K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—A complete illustrated catalogue of electrical accessories (pp. 127).

B. J. Round & Sons, 8-10, Northampton Street, Birmingham, 18.—A second edition of the technical booklet "Electroplating and Metal Finishing Industry and the 'Epalex' System," by A. J. Round.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—Three new Engineering Department catalogues dealing with "Iscos," terminal boxes and "Sharborn" relays.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—A new catalogue (No. 562) of electric lighting fittings.

Wardle Engineering Co., Ltd., Old Trafford, Manchester, 16, has issued four new illustrated art catalogues dealing with street-lighting equipment (pp. 78), "Workslite" reflectors (pp. 22), "Wardelyte" glassware units (pp. 38), and floodlighting projectors.

Enfield Cable Works, Ltd., 296/302, High Holborn, London, W.C.1.—A general catalogue containing also all the up-to-date tables in connectionn with copper wires and strands.

Walker Fender Co., Ltd., Ladywood, Birmingham, 16.—A folder illustrating table and floor lamps.

Goodliffe Electric Supplies, Ltd., 8, Eagle Street, High Holborn, London, W.C.1.—A leaflet on the "Triometer" insulation testing set.

British Ropes, Ltd., Wakefield.—A catalogue of h.c. copper rod, wire, strip and strand.

Bankruptcy Proceedings

C. S. Berridge, 83, St. John's Street, Bridlington, formerly electrical contractor.—This debtor appeared for his public examination on September 15th at Scarborough. His statement of affairs showed ranking liabilities of £175 and estimated assets of £17, leaving a deficiency of £158. Debtor stated that he made a living up to 1934, when he lost that winter's work owing to the after effects of an accident, to which he attributed his failure. The examination was closed.

C. V. Adnitt, 11, Alfred Street, Rugby, formerly carrying on business at 20, Lawford Road, Rugby, as a radio dealer.—The first meeting of creditors herein was held at the Official Receiver's Office, 9-11, High Street, Coventry, on September 15th. Debtor attributed his failure to bad trade, competition and illness. His statement of affairs disclosed a deficiency of £331.

J. E. Lander, 26, Union Street, and 12, School Road, Newton Abbot, electrical and radio engineer.—The application for discharge herein was heard at the Castle, Exeter, recently. The discharge was granted subject to one month's suspension.

D. S. Williams, electrical engineer and contractor, 342, Dewsbury Road, Leeds.—Last day for receiving proofs for dividend September 29th. Trustee, Mr. C. H. Baker, 3, Alfred Street, Boar Lane, Leeds.

F. W. Albinson, electrical engineer, 73, Stanton Road, Sandiacre.—First meeting September 25th at 22, Regent Street, Park Row, Nottingham. Public examination October 20th at the Court House, Derby.

A. E. Poole and **H. Marsters** (Poole's), electrical engineer, 33, Union Street, Wednesbury.—Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham, released August 26th.

F. J. Couchman, wireless and electrical engineer, 1, High Street, Sturry.—Public examination October 6th at the Guildhall, Canterbury.

J. Cameroff, electrical engineer, 147, Spencer Place, Leeds.—First and final dividend of 1s. 4d. in the £, payable September 28th at 24, Bond Street, Leeds.

M. Franks, electrical and radio engineer, 4, Bayford Road, Littlehampton.—Receiving order made September 15th on a creditor's petition.

C. A. Brown, wireless and electrical, 36, Leagrave Road, Luton.—Discharge suspended for nine months until May 6th, 1937.

W. A. Prince and **C. S. Prince** (Prince Bros.), electrical contractors, 18, Woodlands Road, Handforth.—Last day for receiving proofs for dividend October 5th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

Company Liquidations

Electro Chemical Processes, Ltd.—The statutory first meetings of creditors and shareholders were held on September 17th at London Bankruptcy Buildings under the compulsory liquidation of Electro Chemical Processes, Ltd., of North Acton. Mr. H. P. Naunton, Assistant Official Receiver, reported that the company was incorporated as a public company in December, 1928, under the title of Einstein's Electro Chemical Process, Ltd., and was formed to acquire from Vladimir I. Einstein a process for the metallising of materials by electro-chemical action and the patents in connection therewith; also to carry on business as electricians, electroplaters, druggists, chemists, &c. The issued capital was £567,038, of which £289,714 was subscribed in cash, and the preliminary expenses amounted to £42,255. The company acquired the benefit of the secret processes, &c., from Einstein for £210,000, which was paid as to £40,000 in cash and the balance in shares, and by a further agreement Einstein undertook to serve the company for five years at a salary of £1,500 per annum. A prospectus was issued in January, 1929, inviting subscriptions for 250,000 £1 preference and 250,000 4s. ordinary shares. The issue of the prospectus was preceded by an intensive Press campaign and the issue was over-subscribed. In July, 1929, the company acquired the world's rights (except U.S.A., Mexico and Latin America) of a process for the production of colloids to be used in conjunction with the Einstein process, the consideration being £120,000, payable as to £16,000 in cash and the balance in shares. Late in 1930, following a meeting of the larger preference shareholders, two other members were co-opted to the board to watch the interests of the shareholders. About this time the company acquired the rights to the "Eldona" process for plating glass and china, at a cost of £3,000, and in January, 1931, purchased a French process for chromium plating for £800. Both these processes were capable of immediate commercial exploitation. In February, 1032, the name of the company was changed. In January, 1936, the goodwill, plant, machinery and stock of the colloidal side of the business were sold for £9,200 to Boot's Pure Drug Co., Ltd. The statement of affairs lodged under the liquidation showed total liabilities of £7,544, of which only £409 was expected to rank for dividend, against net assets of £7,979. There would, therefore, be payment of 20s. in the £ to the unsecured creditors, but with regard to shareholders there was a deficiency of £553,997, and only a small dividend could be anticipated. The failure of the company was attributed by its officers to the fact that the processes acquired from Einstein were in some cases technically unsound and in others commercially valueless; to the severe competition in the ordinary plating trade into which the company entered, and to the lapse of time and heavy expenditure incurred before it was in a position to market satisfactory colloidal products which depleted its resources and left no funds available to build up the necessary selling organisation. A liquidator was nominated at the meeting of creditors, but the shareholders decided to leave the liquidation in the hands of the Official Receiver.

Westminster Wholesale Electrical Co., Ltd., Tanswell Street, S.E.—Under the compulsory liquidation of this company the liabilities amount to £3,387 against assets of £127; the issued capital consists of 900 ordinary £1 shares, and the deficiency is estimated at £4,160. Mr. G. W. Hutcheson, Assistant Official Receiver, reports that the company was formed in August, 1930, to carry on business as electricians, electrical and mechanical engineers, and wholesale and retail dealers. C. G. F. Turpitz was appointed managing director and chairman for life at £800 per annum. The company acquired the goodwill of a wholesale electrical supplies business carried on by him at Lambeth and at Bond Street, Brighton, for £900 in shares and an undertaking to discharge all existing debts. Turpitz had been engaged in the electrical accessories trade for over twenty years, mainly as an importer selling to the wholesale trade, and had also dealt with the retail trade both in London and Brighton under the style of "The Westminster Electrical Co." The trading throughout resulted in a gross profit but a net loss of about £3,000. The company was financed from time to time by Turpitz, a present creditor for £1,470, in respect of money advanced and goods supplied. No financial difficulty was experienced until September, 1935, but subsequently several creditors obtained judgments against the company, and one of the number lodged the petition upon which the winding-up order was made last March. The failure of the company is attributed by Turpitz to the action of a former manager who left the Brighton branch in August, 1935, and starting in opposition, took away the company's trade; also to heavy overhead expenses and keen competition. The Senior Official Receiver remains the liquidator of the company.

Barton-on-Humber Electric Supply Co., Ltd.—Meeting October 19th at 36, Park Place, Leeds, to receive an account of the winding-up by the liquidator, Mr. J. J. H. Stansfield.

Electricity Supply

Lighting, Domestic, Power

Abergele.—FUTURE OF ELECTRICITY UNDERTAKING.—At its recent meeting the Urban District Council referred to the Finance Committee for consideration a proposal that, in view of the refusal of the Electricity Distribution of North Wales and District, Ltd., to sell its undertaking in Abergele to the Council, the Electricity Commissioners should be asked to compel the company to do so.

Australia.—PROGRESS OF THE SYDNEY UNDERTAKING.—From the general manager of the Sydney (Australia) County Council Electricity Undertaking, Mr. H. R. Forbes Mackay, we have received a report of the progress in 1935. During this period the undertaking was owned and controlled by the municipality, the new administration becoming effective as from January 1st of this year. Revenue was £2,555,933 (£2,541,588 in 1934), the expenditure amounting to £1,178,700 (£1,026,612). There was a surplus of £72,110 (£198,370). During the year 520,363,500 kWh was generated at the Bunnerong and Pyrmont generating stations (518,775,200 kWh at Bunnerong), of which 428,615,247 kWh was sold (398,632,002 kWh in 1934); the average cost was 1.391d. (1.411d.) per kWh, and the revenue obtained 1.41d. (1.49d.). The highest average price per kWh paid by any one consumer for electricity supply for other than temporary purposes was 5d. per kWh, and the lowest 0.5d. by a metal melting firm. The number of consumers at the end of the year was 226,623 (217,392). An extensive showroom is maintained and as a result of the activities of the appliance demonstration and service sections a total increased load of 1,941 kW was obtained. The growing demand for electricity for heating was evidenced by the recent installation of all-electric equipment in the kitchen of a restaurant, the total cooking load in this particular case being over 200 kW. Motors are the only apparatus hired out by the undertaking and 2,757 (2,786) were hired during the year. For stimulating the use of electricity a £15,000 advertising campaign was approved. The efforts of the Electricity Sales Branch resulted in the addition of 23,078 kW to the connected load, which should result in an annual consumption of 12,200,042 kWh. The Bunnerong power station and a night view of Sydney are illustrated on the facing page.

Aylesbury.—CORONATION ARRANGEMENTS.—A sum of £400 is being allocated to the decoration of the streets for the Coronation, and the Electricity Committee has been authorised to provide illuminations.

Billinge.—FRINGE ORDER.—The Urban District Council has consented to St. Helens Corporation applying for a Fringe Order to authorise the Town Council to give a supply of electricity in the King's Moss area.

Bridgend.—INQUIRY TO BE HELD.—At the request of the Urban District Council and of the electrical engineer, Mr. William Welbury, the Minister of Health has decided to hold a public inquiry following the acquittal of Mr. Trefor David at the Glamorgan Assizes on charges of publishing a defamatory libel against Mr. W. Welbury and Mr. H. P. Williams, a former chairman of the Council.

Bury (Lancs).—NEW TARIFF.—The Corporation has adopted the following new tariff, as from October 1st:—Lighting, flat rate, first 500 kWh per quarter, 4d. per kWh; beyond at 3d. Domestic tariff, fixed charge per annum equal to 14 per cent. of the rateable value, with 1d. per kWh for the first 50 kWh per quarter, and ½d. per kWh beyond. Shop window lighting after business hours, 2d. per kWh. Cinemas, first 1,000 kWh per quarter at 2½d., next 1,000 at 2d., beyond at 1½d. Outdoor signs, 3d. per kWh. Heating, first 1,000 kWh per quarter at ¾d., beyond at ½d. Bakers' ovens, first 1,000 kWh per quarter at ¾d., beyond at ½d. Refrigerators, 1d. per kWh. The motor power rates have also been revised. All accounts are subject to a discount of 7½ per cent. for payment within 21 days.

Clydebank.—ELECTRICITY V. GAS.—The Housing Committee, after a debate on the respective merits of gas and electricity, has decided that gas shall be used for cooking and electricity for lighting and heating at the North Kilbowie housing estate. The Clyde Valley Electrical Power Co. will provide the electricity supply.

Colwyn Bay.—LOANS.—The Corporation has applied for the following loans in connection with the change-over and for new mains for extensions: Plant and alterations to Ivy Street sub-station, £2,773; new mains, &c., £9,188; consumers' apparatus, £9,061; kiosk, £913; linking up of high-voltage ring mains, £1,153; and mains for future extensions, £10,000.

Dudley.—SUB-STATION.—The Midland Electric Corporation for Power Distribution, Ltd., is to erect a sub-station in Lime Pit Lane.

Dunstan and Craster (Northumberland).—ELECTRICITY SCHEME.—Both villages are to be provided with electricity for domestic purposes and street lighting.

East Grinstead.—CORONATION ILLUMINATIONS.—The electrical engineer, Mr. J. B. Morgan, is to prepare a scheme of illuminations for the Coronation.

Gateshead.—ELECTRICAL EQUIPMENT.—The Town Council is to spend £31,550 in connection with electrical and general engineering equipment for the extensions to the hospital.

Glasgow.—HOSPITAL HEATING.—For the heating and domestic hot-water services at the new nurses' home at Gart-

loch Mental Hospital electrode boiler plant is to be installed. The Clyde Valley Electrical Power Company will supply electricity on the following terms: The Corporation will pay to the company for lighting and general purposes 0.5d. per kWh, the charge for electrode boilers for heating and domestic hot-water supplies to be 0.3d. per kWh on condition that the heating and domestic supply load is shut off for 2½ hours in the morning and 2½ hours in the afternoon.

Grimsby.—DISTRIBUTION WORK.—A brick sub-station is to be built on the site of the existing kiosk in Yarborough Road, while sites have been purchased by the Council for other sub-stations at Utterby and Grainthorpe.

Hastings.—LOAN.—Sanction to a loan of £2,720 for an additional transformer and equipment at Shepherd Street sub-station has been received by the Town Council.

PUBLIC LIGHTING AT CATSFIELD.—The Catsfield Parish Council has agreed to enter into an agreement with the Corporation for a supply of electricity for public lighting at Catsfield.

SUPPLY EXTENSION.—A supply of electricity is to be provided by the Electricity Committee to Strawberry Hole Farm, Northiam, and the oast-houses adjoining, the owners of the properties having each agreed to consume or pay for electricity to a certain minimum annual amount for a period of five years. A supply is also to be given to Horsman's Farm, Sedlescombe.

India.—CALCUTTA E.S. CORPORATION'S LARGE NEW STATION.—A large station for the supply of electric power to the south of Calcutta is now being constructed by the Calcutta Electric Supply Corporation at a place known as Mulajore, on the east bank of the Hooghly River about twenty miles north of Calcutta. It is expected to be in commission by about the end of 1938. The station will be second to none in the whole of India, and its ultimate capacity will be 500,000 kW, the present layout being for half that capacity. Steam at 700 deg. F. will drive the turbines, rotating the alternators at 3,000 revolutions per minute, each alternator having a capacity of 30,000 kW. It is intended to construct the basement 18 ft. 6 in. below ground level, the object being to reduce the height to which water will have to be pumped. Electricity will be generated at 33,000 V and transmitted from the station at this voltage in the first instance; later, for long-distance transmission, it is probable that the voltage will be raised to 132,000 V.

Ipswich.—NEW EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £60,000 for mains and services and £10,000 for sub-station equipment.

TRACTION SWITCHBOARDS.—In consequence of the extension of the trolley-bus routes, it will be necessary to install new traction switchboards in the Duke Street sub-station, Roundwood Road sub-station, and the trolley-bus depôt at Priory Heath, at a cost of £1,447.

London.—ISLINGTON.—Sanction has been obtained by the Electricity Committee to a loan of £3,308 for the provision of automatic fire-protection apparatus for switchgear, equipment, &c., at the electricity works and sub-stations.

HAMMERSMITH.—The Electricity Committee is to provide increased supply, at a cost of £360, to Chibnall's Bakeries, Hughenden Road, and has obtained sanction to borrow £3,000 for wiring, £7,000 for meters and £8,000 for consumers' apparatus, and is seeking sanction to borrow £4,000 for sub-stations.

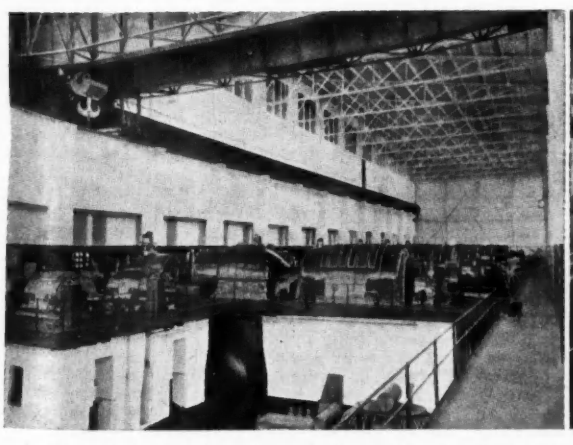
HACKNEY.—The Baths Committee has unanimously recommended the adoption of an all-electric scheme for its new central baths establishment, after having considered estimates of the comparative costs of coal, oil, coke and gas-fired as well as electric heating installations. The thermal storage system of electric heating, with a storage period of six hours, was chosen. It is estimated that the annual consumption of electricity in connection with the scheme will be not less than 3,960,000 kWh.

FINSBURY.—To discourage children from playing in the streets many school and public authorities now leave their playgrounds open for an hour or so in the evening. The photograph reproduced on this page shows the children's playground at Bartholomew Square, London, where an installation of 400-W "Osira" electric-discharge lamps has recently been carried out. The equipment has been installed to the requirements of the Finsbury Electricity Department, G.E.C. lanterns being suspended from 10-ft. projecting bracket arms on steel poles at a mounting height of 25 ft. from ground level.

The playground at Bartholomew Square, Finsbury

Norwich.—LIGHTING IMPROVEMENTS.—The City Council's Electricity Department is carrying out an extensive scheme of street-lighting improvement. The work was started in February, and in a month 177 lamps had been connected. It is anticipated that the scheme will be finished within eighteen months.

Portland.—GENERATING PLANT.—An order is being placed for additional generating plant at H.M. Dockyard, Portland.



A night view of Sydney showing the profuse lighting, and, left, the turbine room at Bunnerong, the County Council's main power station (see note under "Australia" on page 416)

ST. PANCRAS.—The Electricity and Public Lighting Committee proposes to reduce the lighting flat rate from 3d. to 2¾d. per kWh, and to revise other charges. The estimated annual decrease in revenue is £22,800.

Following a report by the borough electrical engineer and manager that a certain portion of the high-voltage switchgear would have to be replaced owing to the increased severity of conditions of operation, Messrs. A. Reyrolle & Co., who installed the original equipment, carried out exhaustive experiments to determine the ultimate capacity obtainable with the class of switch that it was proposed to install, and a type with a safe making and breaking capacity of 500,000 kVA was evolved, to utilise which to the best advantage modification of the Council's gear is necessary. The company has submitted a quotation of £17,155, of which £15,630 is in respect of equipment at the power station and £1,525 is for switchgear in the switch-house at Great College Street.

Rosehearty.—SUPPLY INAUGURATED.—The supply of electricity from the Grampian scheme has been brought into operation in Rosehearty and most of the houses are now electrically illuminated for the first time. It will be several weeks yet before the streets are lighted.

Russia.—HYDRO-ELECTRIC WORKS.—The Svir hydro-electric station No. 3 was taken over for industrial operation by the Soviet State Commission on September 14th. The expenditure on the works has amounted to 240 million roubles and the station has already supplied Leningrad with 1,300,000,000 kWh. Together with the Volkhof station, it is able to furnish Leningrad with between 37 and 44 per cent. of the entire demand.

Sunderland.—NEW EQUIPMENT.—The Town Council proposes to install a transformer costing £775 and to spend £420 on mains at the Highfield Institution. It is also to spend £835

on mains in Gladstone Street and Selbourne Street and £176 on similar work in Sans Street.

Sweden.—FURTHER EXPENDITURE ON HYDRO-ELECTRIC SCHEMES.—The Waterfalls Board reports to the Government that, for the next financial year, it intends to ask for grants amounting to Kr.18,525,000; of this sum Kr.3,500,000 is for continued work on the Stadsforsen power station, Kr.250,000 for the installation of a second set at the Sillre power station, Kr.800,000 for the construction of a second escape tunnel at the Porjus station, Kr.7,000,000 for a new supply canal at the Trollhättan station, Kr.230,000 for the modernisation of the Nykvarn power station and Kr.1,600,000 for work in connection with the regulation of Lake Vänern, water from which operates Trollhättan, Vargön and other power stations. A sum of Kr.3,675,000 will be used to continue the construction of the big power-distribution line that will connect the northern production system (the centre of which is Porjus) with the central Swedish system, which has Västeras as its centre. A sum of Kr.6,400,000 will be spent on other extension work on the distribution system; it is required largely on account of the expected electrification of part of the private railway system known under the collective name of Bergslagsbanan, together with other junction lines in west Sweden.

Tredegar (Mon).—EXPECTATIONS EXCEEDED.—The first year's working of the electricity undertaking has produced results which are more satisfactory than was anticipated. This was stated last week by Mr. William Davies, electrical engineer and manager to the Council, in presenting his first annual report. Mr. Davies, in fact, described the results as "extraordinary." He said that the estimate of sales was 90,000 kWh, whereas the actual quantity sold reached 259,617 kWh; that the losses amounted to only 11.9 per cent., as compared with an estimate of 20 per cent.; and that the total number of consumers supplied was 718, as against an estimated number of ninety. Altogether, it has been expected that there would be a loss of approximately £640 on the first year's working, but instead a net profit of £190 was made after clearing a deficit of £60 incurred in the first three months of operation.

Tynemouth.—LOANS.—Sanction is being sought by the Electricity Committee to a loan of £10,000 for mains and services and £3,000 for sub-station plant.

United States.—BRIDGE LIGHTING.—An interesting highway lighting installation is being put into operation on the San Francisco-Oakland Bay bridge, states *Electrical News and Engineering*. There are 924 sodium lamps to light the 15 miles of roadway of the double-deck span, the tunnel and the approaches comprising the large new link between the two cities. Passenger vehicles and other high-speed traffic will move on the upper deck of the bridge, which will have 673 sodium lighting units, while the lower deck, to be used by trucks and similar lower-speed traffic, will be lighted by 251 units.

Worcester.—LOANS.—The City Council has applied for sanction to loans of £50,000 for low-voltage mains and £10,000 for sub-station equipment, including transformers.

Traction

Aberdeen.—PROFIT FROM TRAMS.—Revenue from the municipal tramways, at £153,769, was £3,752 higher in 1935-36 than in the previous year, reports Mr. A. Smith, the general manager. Working expenses amounted to £115,776, leaving a gross profit of £37,993 (against £36,026 in 1934-35). After setting aside £29,587 for interest, sinking fund, depreciation, &c., there is a net profit of £8,406, of which £2,000 is being allocated to the Common Good fund. The Department owns a fleet of 107 tramcars and operates services over 12.38 miles of double track and 0.47 miles of single track. It also provides bus services, from which a net profit of £8,076 was derived last year. Passenger journeys numbered 38,750,234 (trams) and 29,277,084 (buses), the total of 67,983,105 being an increase of 4,372,779 on the previous year. Electricity used (6,176,287 kWh) represented 2.281 kWh per car-mile, the average cost being 0.713d. per kWh. The average number of passengers carried per car-mile was 14.31 and the average fare per tram passenger was 0.95d.

France.—ELECTRIFICATION OF THE PARIS-LE MANS LINE.—The State Railway Company has almost finished the electrification of the Paris-Le Mans line, reports *Reuter's Trade Service* from Paris. A supply at 1,500 V d.c. is being employed, and the lines of the inner and outer suburbs terminating at the Montparnasse station have been entirely modernised. Simultaneously with the electrification work the tracks between Paris and Versailles have been doubled. The Paris-Montparnasse line will be fed by thirteen sub-stations, which will be connected with double 60,000-V or 90,000-V lines, with the exception of the Chartres and Le Mans stations which will be supplied by underground cable at 30,000 V. The sub-stations will be equipped with mercury-vapour arc rectifiers and will function automatically. Remote control of all the apparatus in the sub-stations from a point near the Montparnasse station is provided for. This is the first time that a distant control station of this size has been erected in France. The actual plant is similar to that used on the Berlin suburban railways and was ordered from Germany. The chief innovations are in the rolling stock. Various types of traction material have been ordered according to the nature of the traffic, there being three types of locomotives and three of rail-cars. There are to be twenty-three passenger locomotives each with four traction motors totalling 4,000 h.p., providing for a maximum speed of 150 k.p.h. Thirty-five locomotives of over 2,000 h.p. are in course of construction; their maximum speed was expected to be 95 k.p.h., but during trials on the Midi line 105 k.p.h. was maintained. The third type is of 1,100 h.p. and capable of a speed of 90 k.p.h. Rail-cars will be largely used. The suburban service between Sèvres, Trappes and Rambouillet will be run by rail-cars each comprising two rustless steel coaches mounted on three bogies. The total h.p. will be 1,080 continuous or 1,320 hourly, and the speed over 130 k.p.h., with an acceleration of more than 1 m/s per sec. The overall length will be 40 metres and the weight will not exceed 63 tons unladen. There will also be special rail-cars for conveying passengers from the smaller stations to the main-line stations. They will be 22 metres long and mounted on two bogies; all the axles will be driving axles, the total h.p. being 720. Their maximum speed will be over 120 k.p.h. and their weight about 36 tons. Electric trains are expected to run on the Paris-Le Mans line by the middle of next year.

Germany.—A RACK-AND-PINION ELECTRIC LOCOMOTIVE.—In order to meet the increased traffic requirements on the Wendelstein rack railway a new rack-and-pinion electric locomotive embodying a number of special features has recently been added to the rolling stock. The locomotive, the electrical equipment for which was supplied by the Siemens-Schuckert Works Co., is equipped with two d.c. shunt-wound motors of 100 kW each at one-hour rating, connected permanently in series across the overhead 1,500-V supply. The motors drive through a slipping coupling on to a countershaft, and thence to the driving gear wheels, or on level stretches and slight gradients directly on to the driving wheels, with a total reduction ratio of 1 to 11.6. A friction clutch is interposed between the countershaft and the driving wheels in order to compensate for any difference in peripheral speed between the two when the locomotive enters the rack, the coupling to the driving wheels being disengaged when the engine is running on the rack. The motors are controlled by a cam-operated hand controller with ten starting notches. After passing the last notch a resistance is gradually inserted in the shunt field, which permits of a 50 per cent. reduction of the field current when travelling on the level and on light gradients. On down gradients regenerative braking is adopted. Should the supply system be incapable of absorbing the return current, an automatic circuit-breaker, which also acts as the main breaker, switches the motors on the resistances. The same circuit-breaker also switches over automatically in the event of failure of the supply voltage, excess voltage, overload and application of the mechanical brakes. Another special feature is that a controller setting is provided for a snow plough. When this is in action the engine is driven at 1.25 m.p.h. This speed is obtained by using the brake resistances with the motor fields excited from the supply instead of being self-excited as when the motors are operating as generators. An emergency compressed-air brake is provided which, when operated, also brings hand brakes into action by means of a compressed-air switch. At the same time the automatic circuit-breaker switches over to the resistance braking position.

Newcastle-on-Tyne.—TROLLEY-BUSES TO REPLACE TRAMS.—The tram service operating on the Stanhope Street-Welbeck Road-Church Street route, extending over six miles, is to be replaced by trolley-buses.

Poland.—ELECTRICAL PLANT AS PART DEBT PAYMENT.—It is reported that half the £3,000,000 which the German State Railways owes to Poland is to be paid in dynamos, turbines and other electrical equipment.

United States.—STEAM-ELECTRIC LOCOMOTIVE.—A new steam-electric locomotive is being built for the Union Pacific railroad, states *Reuter's Trade Service* from New York. This locomotive is being built by the American General Electric Company, and will carry a condensing steam-turbine generating plant. The traction motors will be of the usual design, and the turbine will operate condensers using the same water repeatedly, with small additions to make up for leakage. It will be a double-cab unit rated at 5,000 h.p., streamlined, practically smokeless and provided with air-conditioning equipment. A speed of 110 m.p.h. on the level is anticipated.

Communications

Czechoslovakia.—PICTURE TELEGRAPHY.—The Czechoslovakian Post and Telegraph Authorities have recently established a picture telegraphic service between Prague and Great Britain, France and Germany.

Greece.—STATE CONTROL OF BROADCASTING.—All broadcasting stations in Greece are to be State-controlled, according to a decree which has been published by the Under-Secretary of State for Communications. This law will be published in due course in the Government *Gazette*, which states that a special broadcasting service is to be established by means of a new station in Athens, run by the Ministry of Communications. In order to cover the expenses taxes are to be levied on the owners of all radio sets. The tax payable will vary according to the situation of the set.—*Reuter*.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Argentina.—BUENOS AIRES.—October 9th. State Oilfields Directorate. Four electric motors and accessories. (T.Y. 30765.)*

Australia.—TOWNSVILLE.—December 17th. City Council. One 2,500-kW geared turbo-alternator. (T.Y. 30758.)*

MELBOURNE.—December 1st. State Electricity Commission of Victoria. Two transformer circuit-breakers, one bus tie circuit-breaker unit, one station transformer circuit-breaker unit, eight feeder circuit-breaker units, two current transformers and transfer trucks. (T. 30804.)*

Birkenhead.—October 1st. Mersey Railway Company. Various stores, including electrical sundries, metallic and carbon filament lamps and fittings and chemicals, &c. J. Shaw, general manager and secretary, Central Station.

Birmingham.—October 5th. Electric Supply Department. Up to 1,000 two-part tariff prepayment meters. (See this issue.)

Dalkeith.—September 28th. Town Council. Electrical work at a housing estate. Morham and Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Dumfries.—October 5th. Town Council. Electrical work at thirty-four houses at Nithside. Burgh surveyor.

Egypt.—CAIRO.—November 17th. Ministry of Public Works. Equipment for Gebel Aulia colony, Sudan, comprising electrical distribution network, power house (Diesel), workshop, filter plant, ice plant and pumping sets. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (deposit £2 1s., not returnable).

Fife.—October 5th. County Council. Electric lighting at sixty-eight houses at Lochore and eighty-four at Rosewell, Lochore (separate schemes). C. R. Douglas & Son, surveyor, 15, East Port, Dunfermline (deposit £1 1s. each).

Glasgow.—October 1st. Corporation. Electrical installation at 114 houses on the Dalmarnock Road housing estate. Town Clerk's Office, Room 36.

Gloucester.—Electricity Department. Electricity meters and p.i. cables. (September 18th.)

Goole.—October 6th. Borough Council. Electrical work in fifty houses. J. H. Castle, borough engineer, Municipal Offices (deposit £3 3s.).

Harrogate.—Electricity Department. Cables for one year. (See this issue.)

India.—NEW DELHI.—December 3rd. Stores Department. A.c. 220/230-V sweep ceiling fans. (T. 30736.)*

December 10th. D.c. 220/230-V sweep ceiling fans. (T. 30735.)*

January 7th, 1937. 220/230-V a.c. and d.c. table fans. (T.Y. 30741.)*

September 30th. Bombay, Baroda and Central India Railway Co. Gas-filled and vacuum tungsten filament lamps. (September 18th.)

October 27th. 4,500-kW, 6,600-V turbo-alternator set, condensing plant and auxiliaries. (T. 30779.)*

London.—SOUTHWARK.—September 30th. Borough Council. Electric cable during the twelve months ending November 30th, 1937. (September 18th.)

COMMISSIONERS OF H.M. WORKS.—October 1st. Electric light shades. Controller of Supplies, H.M. Office of Works, King Charles Street, S.W.1.

Middlesex.—October 22nd. County Council. Eleven electrical service lifts at the Shenley Mental Hospital. (See this issue.)

Midlothian and Peebles.—September 26th. District Asylum, Rosslynlee. Various articles, including electrical fittings, and materials and fittings for machinery and boilers. Chilton L. Addison-Smith, clerk, 19, Heriot Row, Edinburgh.

Newcastle-upon-Tyne—September 28th. City Council. One industrial vacuum cleaning plant for public service vehicles. General manager, Transport and Electricity Department, Manors.

October 10th. Transport and Electricity Committee. Twenty-five double-deck trolley-buses with chassis and electrical equipment. T. P. Easton, general manager, transport and electricity undertaking, Manors (deposit £2 2s.).

New Zealand.—WELLINGTON.—November 3rd. Public Works Department. One set of 11,000-V, indoor, metal-clad switchgear. (T.Y. 30742.)* Two 100-kVA transformers. (T.Y. 30743.)*

November 10th. Nine switch-fuse limiting resistance combinations and five sets of galvanised steel structures, each set to carry one 100-kV, 3-phase switch-fuse limiting resistance combination with climbing steps and brackets for switch operating mechanism. (T. 30798.)*

November 24th. Seven 1,000-kVA, 50-kV/11-kV, oil-immersed, single-phase transformers and spares for the Arapuni power scheme, section 527. (T. 30803.)*

Plymouth.—October 3rd. Electricity Department. L.v. underground network, disconnecting boxes. (September 18th.)

Portsmouth.—October 2nd. Town Council. Alternative schemes for the Burgoyne Road pumping station: (a) Removal of existing plant and installation of two centrifugal pumps (220,000-gal. per hr. each, against total gauge head of 27ft.), with motors, starters, cables, &c. (b) Removal of existing plant and installation of two 55-b.h.p. squirrel-cage motors with starters, cables, &c. City engineer, Guildhall (deposit £2 2s.).

Preston.—October 12th. Corporation. Wiring for electric lighting at the Institution, Fulwood. (See this issue.)

Repton.—September 29th. R.D.C. Motor and centrifugal pump at the Castle Gresley sewage disposal works. Willcox, Raikes & Marshall, 33, Great Charles Street (deposit £2 2s.).

Sheffield.—September 28th. Electricity Committee. Two 15,000-kVA transformers, with on-load tap-changing gear. (September 11th.)

South Africa.—CAPE TOWN.—October 16th. Public Works Department. Electric cooking apparatus, refrigerators and food preparation machines for the Hospital, Groote Schuur. (T. 2008.)*

October 21st. Electricity Department. 230-V electric lamps of various wattages. (T. 30792.)* Single- and double-pole iron-clad service cut-outs. (T. 30795.)* Overhead line material. (T. 30796.)*

October 28th. Two 3,000-kVA transformers. (T.Y. 30797.)*

JOHANNESBURG.—October 9th. Public Works Department. H.v. and l.v. switchgear and transformers. (T.Y. 30773.)*

October 23rd. Electrically operated hauling winch. (T.2006.)*

PRETORIA.—October 23rd. Union Tender and Supplies Board. Twenty lamp signalling, multiple type, private branch switchboards. (T. 30774.)*

RUSTENBURG.—October 30th. Municipality. Three 250-kW generators, engine room crane, condensing plant, circulating water plant, switchgear, transformers, erection gear, transfer of existing engines and electric master clock. (T. 30790.)*

Southend.—November 19th. Electricity Department. One 750-kW alternator. (See this issue.)

Swansea.—October 5th. Electricity Department. 33,000-V outdoor sub-station. (September 18th.)

Uruguay.—MONTEVIDEO.—October 28th. State Electricity Supply and Telephones Administration. Electricity meters. (T.Y. 30760.)*

November 13th. Electric metering apparatus, consisting of voltmeters and ammeters, &c. (T.Y. 30788.)*

Wakefield.—September 26th. R.D.C. Electrical wiring, &c., in 142 houses. W. E. Massie, Council's engineer and surveyor, Council Offices, 18, St. John's North.

West Sussex.—October 3rd. County Council. Provision and wiring of electrical plant and buildings at Drayton Depôt, near Chichester. (See this issue.)

Weymouth and Melcombe Regis.—September 29th. Borough Council. 11,000-V overhead and underground lines and l.p. overhead lines. (September 11th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Arbroath.—Town Council. Accepted. Electrical installation at the Public Library extension.—J. E. Crane, Dundee.

Brighton.—Corporation. Accepted. Switchgear for the Southwick power station extension scheme (£3,780).—G. Ellison, Ltd. Low lift centrifugal pump for the power station (£1,245).—Mather & Platt, Ltd.

Colwyn Bay.—Town Council. Accepted. Conversion of electrical machinery at the Laundry due to the change-over (£904).—Crompton Parkinson, Ltd.

Dundee.—Public Health Sub-Committee. Accepted. Electric lighting in the North block of the Maryfield Hospital (£331).—D. J. Macdonald, Ltd.

East Ham.—General Purposes Committee. Accepted. Stage colour lighting equipment at the Town Hall (£243).—Strand Electric & Engineering Co.

Glasgow.—Education Committee. Accepted. Electrical work at temporary extensions at Eastbank secondary and St. Mark's schools (£976).—Kennedy, Stark & Co.

Health Committee. Accepted. Wiring and erecting work for installation of electrical clocks in the extension at Hawkhead Mental Hospital (£114).—G. Fearns, Baird & Co. Two master clocks (£92).—Gent & Co.

Housing Committee. Accepted. Electrical installations at Haghill Road and Dalmarnock Road housing estates (£412).—W. S. Watson, Ltd.

Ipswich.—Health Committee. Recommended. X-ray transformer (£295).—A. E. Dean & Co.

Transport Committee. Accepted. Six double-deck trolley vehicles per annum for three years (£1,690 each).—Ransomes, Sims & Jefferies, Ltd.

London.—ISLINGTON.—Electricity Committee. Recommended. Supplies for twelve months.—Mersey Cable Works; W. Geipel; Walsall Conduits; Brown Bros.; J. A. Crabtree & Co.; G.E.C.; J. H. Tucker & Co.; Belco (London); Forth Woodworking Co.

HAMMERSMITH.—Electricity Committee. Recommended. 2,200-V, single-phase, metal-clad switches (rupturing capacity 50,000 kVA):

	£		£
Crompton Parkinson, Ltd. ...	29 each	**Ferguson, Pailin, Ltd. Recommended**	**69** each
J. G. Statter & Co., Ltd. ...	33 „	General Electric Co., Ltd. ...	69 „
Electric Construction Co., Ltd.	37 „	A. Reyrolle & Co., Ltd. ...	69 „
Johnson & Phillips, Ltd. ...	67 „	English Electric Co., Ltd. ...	70 „

The Committee has accepted the delivery of twenty-five switches from Ferguson, Pailin, Ltd., as a matter of urgency. These switches, however, do not comply with the specification in one minor respect, and the contractors have agreed to reduce the price by £6 18s. per switch.

Recommended. Repairs to the blading of the No. 16 generating set (£670).—C. A. Parsons & Co. 750 special type prepayment meters for installation on consumers' premises.—Measurement, Ltd.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Alterations to the h.v. switchgear at King's Road power station (£15,630).—A. Reyrolle & Co.

Accepted. Fifty lamp standards for electric-discharge lighting (£450).—Bromford Tube Co.

HACKNEY.—Works Committee. Accepted. Ten "Exide Ironclad" batteries (£2,026) (less £94 allowance for ten old batteries).—Electricars, Ltd.

Recommended. Equipment for the improved lighting scheme for main traffic routes: Extension arms and brackets and new steel columns.—Bromford Tube Co. Chokes and condensers for electric-discharge lamps.—Holophane, Ltd. "Difractor" lanterns for metal-filament and electric discharge lamps.—G.E.C.

Housing and Town Planning Committee. Electric lighting and power at the Cazenove Road housing estate:—

	£		£
F. H. Wheeler & Co. Recommended	**1,999**	T. H. Smerdon	3,152
J. H. Golding	2,560	Sellcon Electrical Co.	4,030
W. J. Baker	3,063	J. Edward	4,935
		F. A. Stroud	8,010

Maternity and Child Welfare Committee. Recommended. Artificial sunlight lamps for the new Maternity and Child Welfare Centre, Richmond Road (£162).—Hanovia, Ltd.

Taunton.—Town Council. Accepted. Wiring of small dwellings during one year.—P. Taylor.

Forthcoming Events

Birmingham Electric Club.—Friday, September 25th. Grand Hotel, Birmingham. 7 p.m. "The Short Circuit Operation and Testing of Oil Circuit-breakers." Mr. D. Kingsbury.

Institution of Electrical Engineers (*North-Western Students' Section*).—Saturday, September 26th. 2.30 p.m. Visit to the works of Messrs. Metropolitan-Vickers Electrical Co., Ltd., Trafford Park.

Inventions Exhibition.—Wednesday, September 30th, to Saturday, October 10th. Central Hall, London, S.W.1.

National Smoke Abatement Exhibition.—Thursday, October 1st, to Saturday, October 31st. South Kensington, London, S.W.

Junior Institution of Engineers.—Friday, October 2nd. Institution, London, S.W.1. 7.30 p.m. Informal discussion on three topics, including "Will Electric Power Supplant Hydraulic Power on Lifts and Cranes?"

Electrical Power Engineers' Association (*Southern Division*).—Saturday, October 3rd. Holborn Restaurant, London, W.C.1. Annual dinner to the members of the National Executive Council.

Notes

Next Year's I.M.E.A. Convention

The Council of the Incorporated Municipal Electrical Association has accepted the invitation of the Brighton Corporation to hold the next annual convention at Brighton under the presidency of Mr. Frank Forrest, chief engineer and manager to the Birmingham Corporation from May 31st to June 5th. The exhibition will be held at the Corn Exchange, and the various functions in the Large Dome which has recently been extended and renovated. The annual banquet will take place in the Princes Hall, Marine Parade.

Electrical Association for Women

Three hundred delegates attended the conference of the Lancashire and North Wales Area of the Electrical Association for Women at Warrington last week. The principal speakers were Mrs. Pender Chalmers, vice-chairman of the National Committee of the Association; Ald. D. Plinston, chairman of Warrington Electricity Committee; Mrs. A. M. Crow, president of the local Branch; and the Mayor of Warrington (Ald. J. Poole). Later the delegates visited the works of British Insulated Cables, Ltd., at Helsby, and on their return to Warrington they inspected the new electricity showroom.

Whose Mouse?

A mouse that escaped from a packing case containing an electric cleaner which was being taken to a Queen's Ferry resident's house for the purpose of a demonstration, and subsequently was alleged to have done considerable damage to a piano and furniture, was the cause of a claim to the Hawarden Rural District Council last week. In a letter to the Council the resident said that when an official of the Electricity Department called at his house with the sweeper a mouse got out of the case in which the sweeper was packed, and the subsequent damage it did was a responsibility of the Council. The Council decided to inform the applicant that though it was sorry for the inconvenience caused it could not accept liability.

Birmingham Electric Club

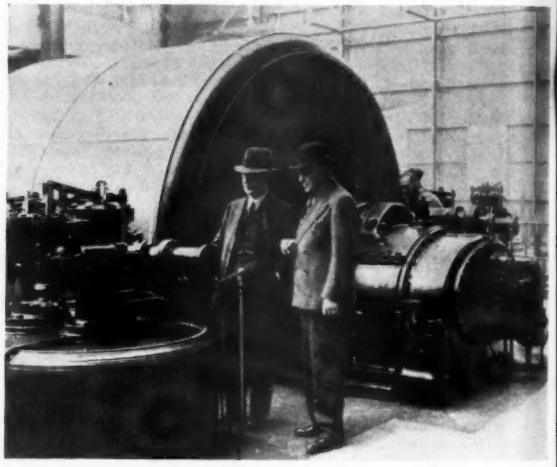
The 1936-37 session of the Birmingham Electric Club commences to-day (Friday), when Mr. D. Kingsbury deals with "Short Circuit Operation and Testing of Oil Circuit-breakers." The Ladies' Evening is fixed for October 16th, and on the 30th Mr. E. A. Watson will talk on "Motor Car Electrical Equipment." Full details are not yet available for the meeting on November 23rd, when "Electrical Equipment of a Large Modern Building" will be dealt with. The annual general meeting is on December 18th. On February 19th Mr. J. F. Driver will speak on "Some High Tension Problems," and "Telephone Equipment" (details later) will be discussed on March 19th, with the reading of premium papers by members on April 23rd. The presidential address is fixed for January 22nd, while the annual dinner takes place on March 5th. All meetings are held at the Grand Hotel, Colmore Row, Birmingham, at 7 p.m., and further particulars are obtainable from Mr. A. M. Fletcher, hon. secretary, 5, Castle Lane, Olton, Birmingham.

A French Conference

Arrangements are in progress for the holding by the Société Française des Electriciens of its thirteenth annual discussion week, which is to be held in Paris. On November 23rd lighting and heating will be dealt with, M. Pux opening a discussion on the lighting of main roads, and M. A. Janet, one on the evolution of illuminated signals in Paris. On the second day discussions will take place on electrochemistry, electrometallurgy, accumulators and dry batteries. November 25th will be devoted to lighting equipment, distribution and traction; November 26th to telegraphy, telephony and radio communication; November 27th to physical research, electrophysiology and measuring instruments and the final day to the generation and mechanical utilisation of electric power.

Valve Rectifiers

The oxide cathode rectifier, which consists essentially of a transformer and a glass bulb filled with a rare gas and provided with a filament of barium oxide heated by a.c. at low voltage, was initially used in small units only, mainly for charging portable batteries. Recently, however, large capacities have been specifically designed for industrial use. Information regarding modern developments is sparse, and a publication of Crypton Equipment, Ltd., on the subject is welcome. This deals with general theoretical principles and operating characteristics, and in addition gives particulars of the Crypton designs which now cover a range of from 1.3 to 300 A up to 250 V.



[*Elec. Rev.* photo

Messrs. J. H. Rider and A. J. Fuller, the consulting engineers, on a tour of inspection of the new Fulham station, which is being officially opened to-morrow (Saturday)

Appointments Vacant

Temporary probationer station engineers (electrical and mechanical) for the Air Ministry.

Student engineer for Reigate Electricity Department.

Electrical engineering assistants in the drawing office of the Air Ministry.

Five lady demonstrators for Birmingham Electric Supply Department.

Assistant lady demonstrator for Battersea Borough Council.

Assistant showroom attendant (female) for Bexley U.D.C.

Showroom sales superintendent for Bury Electricity Department.

Assistant electrical engineer for Brierfield Electricity Department.

Installation inspector for Reading Electricity Department.

Technical assistant at the Engineer's General Office, Metropolitan Police, New Scotland Yard, S.W.

Electrical draughtsman for the Metropolitan Police Engineering Department.

Mechanical draughtsman in the office of the Chief Engineer, Northern Command, York.

Mains foreman for First Garden City, Ltd., Letchworth.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

MAX SIEVERT blow lamps.

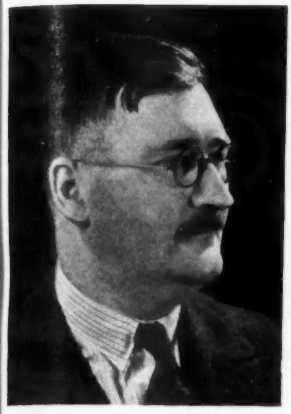
AEROFROTH aerator.

Readers should enclose stamped addressed envelopes when making their enquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. B. Bingham, deputy electrical engineer to the Kirkcaldy Corporation, who has retired after thirty-three years' service, was recently presented with a pair of binoculars by Mr. O. F. Francis, the borough electrical engineer, on behalf of the staff and workmen.



Mr. E. T. Hippisley

Mr. E. T. Hippisley, M.A. (Cantab), A.M.I.E.E., A.M.I.Mech.E., who was recently appointed manager of the Traction Department of the British Thomson-Houston Co., Ltd., has been with the company sixteen years, fourteen of which have been spent on traction work. He was educated at Westminster School, being a King's Scholar, and later studied at Trinity College, Cambridge. From 1914 to 1919 Mr. Hippisley served in the army, attaining the rank of sergeant in the Royal Engineers and subsequently captain in the Royal Artillery. In 1920 he joined the B.T.H. Rugby Works as a student apprentice, entering the Traction Department three years later, where he has since been engaged mainly on project engineering. For a paper on traction, published in the I.E.E. *Journal* for November, 1935, Mr. Hippisley was last year awarded a special premium.

Mr. F. W. D. Adcock, A.M.I.E.E., formerly power engineer to Standard Telephones & Cables, Ltd., has joined Conradty Products, Ltd., as sales engineer.

Mr. J. Wilson has retired after nearly forty years' service with the North-Eastern Electric Supply Co., Ltd., and has been presented with an oak chiming grandmother clock. He started as a draughtsman with the company at the old Pandon Dene power station, but latterly has been at the head offices—Carliol House, Newcastle-on-Tyne.

Mr. R. S. Laird, a student member of the West of Scotland Branch of the Association of Mining Electrical Engineers, has been awarded three prizes, valued at about £16, for his paper on "The Practical Application of Vectors."

The radio friends of **Mr. A. G. Jones,** sales manager of the Reliance Wire Co., Ltd., will wish him a speedy recovery from illness.

Mr. D. R. Moffat, managing director of Messrs. Moffats, Ltd., of Blackburn, is returning from Washington, where he has been attending the World Power Conference.

Miss W. M. Thornley, of Douglas, I.O.M., has been appointed demonstrator and showroom assistant in the Walsall Electric Supply Dept.

Mr. J. Bailey has been appointed electrical engineer and manager of the Barnoldswick Urban District Council's electricity undertaking. Mr. Bailey, who is twenty-six years of age, was educated at Accrington Grammar School, and was apprenticed to Brookhirst Switchgear, Ltd., and at the Dick Kerr (Preston) Works of the English Electric Co., Ltd. He was then appointed assistant electrical engineer to the Brierfield U.D.C., which position he has held for nearly six years. Mr. Bailey is a graduate member of the I.E.E.

Mr. J. Bailey

Mr. H. W. Healy, A.M.I.E.E., has joined Parnall Aircraft, Ltd., as director and general manager. During the past five years Mr. Healy has been works manager of "His Master's Voice" factories at Hayes, Middlesex. He has recently visited America to study modern production control, and contributed a paper on scientific works management to the Sixth International Congress. Mr. Healy took an active part in 1917 and 1918 in connection with the formation of the Electrical Power Engineers' Association.

Sir William J. Larke, K.B.E., is to be president of the Junior Institution of Engineers in succession to Sir Frank E. Smith, K.C.B. He will deliver his address at the inaugural meeting on December 11th, at the Royal Society of Arts.

Mr. B. England, transport manager to the Southend Corporation, has been appointed general manager of the Leicester Corporation Transport undertaking. Mr. England served his apprenticeship with the Consolidated Diesel Engine Manufacturers, Ltd., at that company's Ghent Works, and after war service held various positions with the Yorkshire (West Riding) Electric Tramways Co., Ltd., and its subsidiary, the West Riding Automobile Co., Ltd. He left these companies in 1925 to take up the position of general manager and engineer of the St. Helens Corporation Transport Department, and was appointed transport manager at Southend in March, 1933.

[*Lafayette*

Mr. B. England

Mr. W. F. Jarvis, showroom sales superintendent to the Bury Corporation Electricity Department, has been appointed sales and showroom manager to the Stretford and District Electricity Board. Mr. Jarvis has contributed articles on salesmanship to the ELECTRICAL REVIEW.

Mr. B. Ll. Price

Mr. B. Lloyd Price, A.M.I.E.E., author of the article on "Evaluating Diversity Factor" (page 400), served his general and civil engineering apprenticeship at the Newport Docks of the Great Western Railway Co. For a short period he was with Messrs. Willans & Robinson, Rugby. He was subsequently appointed to the staff of the Newport Electricity and Tramways Departments and is now chief draughtsman. He was a collaborator in a technical capacity in the early days of Messrs. Santon, Ltd.

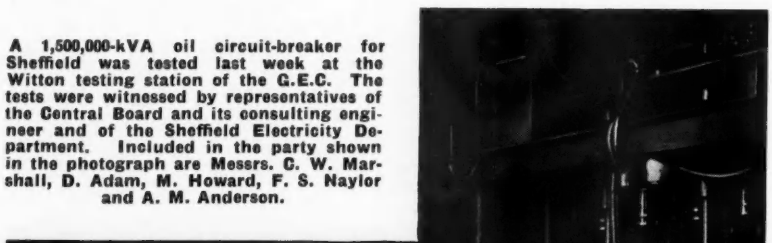
Miss E. Wombwell, who has been a member of the demonstrating staff of the Hotpoint Electric Appliance Co., Ltd., for nine years, has left the service of the company upon the occasion of her marriage, and has been presented by the staff with a canteen of cutlery. The presentation was made by Mr. O. H. Buckingham, general manager of the company.

Mr. V. H. C. Amberg has been appointed managing director of the Express Lift Co., Ltd., of Northampton and Westminster, one of the associated companies of the General Electric Co., Ltd.

Mr. V. H. C. Amberg

Mr. W. R. May, borough electrical engineer at Lowestoft, is retiring from that position. He received his education at Maidstone Grammar School and was apprenticed to a firm of mechanical engineers. On completion of his apprenticeship he worked for a time in a marine shop and from 1889 to 1899 was at sea. Most of the vessels he sailed in had a dynamo and electric lighting, which aroused his interest in electricity, and in 1899 he took up a post at the then new Stockport power station, where he eventually became chief assistant. Mr. May went to Lowestoft in 1903 as chief

assistant to Mr. G. A. Bruce, and when Mr. Bruce resigned in 1913, Mr. May succeeded him as borough electrical engineer. He initiated and developed an a.c. distribution system, and in 1928 the d.c. power station was closed down and a bulk supply from Great Yarmouth was commenced. The d.c. plant was superseded by motor convertors to maintain the d.c. supply temporarily, and now most of the system has been changed over to a.c. Mr. May has seen electric tramways installed and scrapped at Lowestoft, and a service of petrol buses introduced. Mr. May is being succeeded as borough electrical engineer by **Mr. G. W. Steward.**



A 1,500,000-kVA oil circuit-breaker for Sheffield was tested last week at the Witton testing station of the G.E.C. The tests were witnessed by representatives of the Central Board and its consulting engineer and of the Sheffield Electricity Department. Included in the party shown in the photograph are Messrs. C. W. Marshall, D. Adam, M. Howard, F. S. Naylor and A. M. Anderson.

Sir Alfred Read, chairman and managing director, Coast Lines, Ltd., will be inducted as president of the Institute of Transport and will deliver his presidential address at the first meeting of the session 1936-37 on October 12th at the Institution of Electrical Engineers.

Mr. D. W. Barrett and **Mr. Rex Smith** have been appointed to the board of Smith's English Clocks, Ltd., and are at the same time becoming directors of certain associated companies. Prior to taking up the management of Smith's English Clocks, Ltd., upon the formation of the company in August, 1931, Mr. Barrett was assistant sales and publicity manager of S. Smith & Son (Motor Accessories), Ltd., in whose interests he had, when overseas sales manager, travelled extensively abroad. Mr. Smith joined the clock company as sales manager six months after its establishment, leaving the management of the motor-cycle department of Messrs. Smith's business to do so.

Mr. A. P. Healy, A.M.Inst.C.E., A.M.I.E.E., has joined the staff of the Irish Free State Electricity Supply Board, Dublin. After spending two years on the Shannon Scheme, Mr. Healy joined the staff of Messrs. Kennedy & Donkin, with whom he was associated for over six years, working in London, South Wales and Northern Ireland. More recently he has been with Messrs. W. T. Henley's Telegraph Works Co., Ltd.

Institute of Transport Awards.—Among the premium awards made by the Council of the Institute of Transport for 1935-36 are the following:—Railway Engineering Medal (donor: The Railway Companies' Association) awarded to Mr. W. H. Myers, chief electrical engineer, New South Wales Government Railways, for his paper on "Main Railway Line Electrification, with special reference to Conditions in New South Wales." Road Transport (Passenger) Medal (donor: The London Passenger Transport Board) to Mr. A. C. Baker, general manager of the Birmingham Corporation Tramway and Omnibus Department, for his paper on "Municipal Passenger Transport." *Modern Transport* Premium to Mr. E. Sandells, of Messrs. C. A. Parsons & Co., Ltd., for his contribution on "Agreed Charges and Road Transport."

Mr. A. P. Jarvis, who has been appointed to a lectureship in the Department of Electrical Engineering of the University of Birmingham, has been prominently connected with the electrical research laboratory of Messrs. J. A. Crabtree & Co., Ltd., at Walsall for the past six years. Mr. Jarvis graduated with first-class honours in the Engineering School of Birmingham University in 1925—the M.Sc. degree being conferred in 1927 for his research work upon arc phenomena at high frequencies. He has had much teaching experience in technical colleges, and was for two years a teaching scholar in the University to which he now returns.

Mr. J. M. G. Rees has resigned from the board of Oliver Pell Control, Ltd.

Mr. W. S. Jordon, chief electrical engineer with Messrs. Marshall Son & Co. (Successors), Ltd., of Gainsborough, has been appointed engineer-in-chief at London University.

Mr. K. C. Coop, A.M.I.E.E., was married on September 12th at Southport, to Miss Aline Hodgkinson, D.Sc.

Obituary.—Mr. E. Payne.—The death is reported at the age of seventy-six of Mr. Ernest Payne, a pioneer of X-ray research work. Mr. Payne underwent years of suffering as the result of his researches.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

George Green (Gee-Gee), Ltd.—Private company. Registered September 19th. Capital, £2,000. Objects: To acquire the business now carried on at The Gee-Gee Works, Chapel Road, West Norwood, as "George Green & Co.," and to carry on the business of electrical engineers and contractors, suppliers of electricity, &c. The permanent directors are: G. E. Green and Mrs. Q. F. Green, both of The Gee-Gee Works, Chapel Road, West Norwood, S.E. Registered office: The Gee-Gee Works.

Barton Conduits, Ltd.—Private company. Registered September 19th. Capital, £40,000. Objects: To acquire the business of electrical appliance manufacturers carried on by Barton & Sons (1935), Ltd., at Beehive Works, Walsall, Staffs. The subscribers are: F. W. Salter, 48, Hawthorn Road, New Oscott, Birmingham, and P. H. Montgomery, 46, Mayfield Road, Moseley, Birmingham. The first directors are to be appointed by the board of Barton & Sons (1935), Ltd. (parent company). Secretary: Chas. A. Roper. Registered office: Beehive Works, off Green Street, Walsall.

H. G. Edwards & Co., Ltd.—Private company. Registered September 15. Capital, £1,000. Objects: To acquire the business of a radio and electrical engineer and contractor now carried on by H. G. Edwards at The Showrooms, Glan-y-mor Road, Llandudno Junction, as "H. G. Edwards & Co." The directors are: H. G. Edwards, The Showrooms, Glan-y-mor Road, Llandudno Junction, and two others.

Velortex, Ltd.—Private company. Registered September 17th. Capital, £4,000. Objects: To acquire the business of a manufacturer and seller of lamp shades carried on by J. H. Bourne at Wolverhampton. The directors are: J. H. Bourne, Oakland House, Yewtree Lane, Wergs, Wolverhampton, and two others. Secretary: W. G. Billingham. Registered office: Neville House, Waterloo Street, Birmingham, 2.

A. T. Hillman, Ltd.—Private company. Registered September 18th. Capital, £500. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers of and dealers in electrical motive power and light. The subscribers are: Mrs. E. D. Hillman and A. T. Hillman, both of 30, Stroma Road, Mossley Hill, Liverpool. A. T. Hillman is the first director. Registered office: 15, Stanley Street, Liverpool.

Regent Electrical Engineering Co., Ltd.—Private company. Registered September 19th. Capital, £500. Objects: To carry on the business of electrical engineering and public works contractors, decorators, engineers and metal workers, &c. The directors are: L. T. Buckley and L. T. Buckley, jun., both of 54, Beatrice Avenue, S.W.16. Registered office: 14/16, Regent Street, S.W.1.

Returns of Electrical Companies

Weston-super-Mare & District Electric Supply Co., Ltd.—Capital, £180,000 in 40,000 preference and 140,000 ordinary shares of £1. Return dated May 8th, 1936. All shares taken up. £100,000 paid, £80,000 considered as paid. Mortgages and charges nil.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5. Return dated May 8th, 1936. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges: £48,728 3s. 10d.

Cheshire Cables, Ltd.—W. H. Arden, accountant, of 55, Brown Street, Manchester, was appointed receiver on September 12th, 1936, under powers contained in second debentures dated April 21st, 1936.

Challis Transformers, Ltd.—A. E. Limehouse, F.C.A., of 24, Market Place, Rugby, was appointed receiver and manager on September 9th, 1936, under powers contained in instrument dated August 21st, 1935.

Lamp Caps, Ltd.—Capital, £50,000 in £1 shares. Return dated June 23rd, 1936. All shares taken up. £50,000 paid. Mortgages and charges nil.

Central Sussex Electricity, Ltd.—Capital, £230,000 in £1 shares. Return dated May 14th, 1936. All shares taken up. £205,000 paid (£1 on 180,000 and 10s. on 50,000 shares). Mortgages and charges nil.

Electric Ignition Laboratory, Ltd.—Capital, £2,000 in £1 shares. Return dated April 20th, 1936. 1,500 shares taken up. £1,500 considered as paid. Mortgages and charges nil.

Rangoon Electric Tramway & Supply Co., Ltd.—Capital, £1,000,000 in 250,000 preference, 550,000 ordinary, and 200,000 new shares of £1. Return dated May 13th, 1936. 250,000 preference and 550,000 ordinary shares taken up. £735,000 paid on 250,000 preference and 485,000 ordinary shares. £65,000 considered as paid on 65,000 ordinary shares. Mortgages and charges £200,000.

Liverpool Electric Cable Co., Ltd.—Capital, £300,000 in £1 shares. Return dated May 20th, 1936. 150,000 shares taken up. £127,833 paid. £22,167 considered as paid. Mortgages and charges nil.

Metropole Electrical, Ltd.—Mortgage debenture charged on the company's property and assets, present and future, including uncalled capital, dated August 24th, 1936, to secure £300. Holder: H. K. Taylor, 50/54, Rea Street, Birmingham.

Burke & Co., Ltd.—Mortgage on land and 540, Chester Road, Old Trafford, Lancs., dated September 4th, 1936, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

City Notes

Scophony, Ltd., in its report covering the period April 4th, 1935 (the date of incorporation) to March 31st last, states that during this period the company was a private concern with an issued capital of £140,000 in shares of £1 each. On June 4th the company was converted into a public company, the £1 shares being then divided into four shares of 5s. each and the nominal capital being increased to £300,000 by the creation of 640,000 new shares of 5s. each. On July 11th last an offer was made to the shareholders of 140,000 ordinary shares of 5s. each at a premium of 2s. 6d. per share. The issue was fully subscribed and all the shares have been allotted. The issued capital of the company is now £175,000, made up of 700,000 shares of 5s. each. Under the agreements whereby the assets of the company were acquired, no royalties are payable in respect of any inventions owned by the company and no amount is specifically attributable to goodwill. During the period under review, the company's activities have been directed to the technical development of its inventions, and the sum of £21,704 has been spent under this heading. The directors do not propose at this stage to ask for payment of remuneration for their services. Mr. R. E. Cornwall resigned from the board in June last and has been succeeded by Mr. E. J. Wyborn, A.M.I.E.E., chief engineer to E. K. Cole, Ltd.

The company held its first annual meeting on Monday last when Sir Maurice Bonham Carter (chairman), who presided, said it was hoped that they would have medium screen receivers installed for public demonstration in London before the end of the year, and, by the middle of 1937, cinemas equipped with their apparatus for public use. The company appeared to hold a very strong position in the optical-mechanical field of television. Their connection with E. K. Cole, Ltd., was highly valued, but this did not preclude other firms from the benefit of the company's licences for the manufacture of television sets under Scophony patents. Mr. S. Sagall (managing director) questioned the wisdom of operating alternately two different standards of transmission. He thought that a uniform standard for the whole television industry should be set up, similar to those in operation in Germany and the United States.

The Wellman Smith Owen Engineering Corporation, Ltd., has issued its report covering eighteen months to June 30th, 1936. The gross profit for this period was £28,190, of which loan interest and bank overdraft absorbed £6,111 and directors' fees £1,950, leaving a net profit of £20,130, against £10,234 for the year ended December 31st, 1934. After deducting £2,190 for income tax, and £5,333 being profit realised prior to reconstruction and applied therein, a dividend at the rate of 5 per cent. is declared, which absorbs £7,771, leaving £4,835 to be carried forward. Meeting: September 29th.

Max Stone, Ltd., report a profit for the year to June 30th last of £26,486. Income tax reserve takes £5,000, goodwill £7,000, and preliminary expenses £5,000. The preference dividend paid on May 1st last absorbed £2,400, and that accrued for two months to June 30th £800. The ordinary dividend is at the rate of 15 per cent. per annum, less tax, from date of incorporation (January 17th, 1936) to June 30th, and £2,214 is carried forward. Meeting: September 30th.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Appleton's Radio (Tottenham), Ltd.; British Radiodyne, Ltd.; Dorchester Radio, Ltd.; Fanfare Radio, Ltd.; Neon Constructors, Ltd.; Neon Duplexigns, Ltd.; Neon Portable Units, Ltd.; the Northern Wireless and Electrical Manufacturing Co., Ltd.; Wireless Maintenance, Ltd.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Electric & Gas Industries, Ltd.; Electric Sharpeners, Ltd.; Emkabe Radio Co., Ltd.; Modern Electrical Supplies (Leeds), Ltd.; Paragon Wireless Co., Ltd.; Static Electric, Ltd.

The West London & Provincial Electric & General Trust has announced an interim dividend of 2½ per cent. on the ordinary stock (against 1½ per cent.). The increased interim dividend has been declared in order more nearly to equalise payment for the year, and must not be taken to imply any increase in the total dividend for the year.

W. H. Dorman & Co., Ltd., report a net profit for the year ended March 31st last of £1,636, as compared with £11,596 for 1934-35. The debit balance carried forward is now £57,231. The report states that sales were affected by the imposition of a tax of 8d. per gallon on heavy oil used in Diesel engines for the transport industry.

The British Aluminium Co. has declared a final dividend of 6 per cent. per annum, less tax, on its preference shares for the six months ended June 30th.

Burco, Ltd.—An offer for sale of 280,000 ordinary 5s. shares at 10s. per share in the company's capital will shortly be made by the London Industrial Finance Trust, Ltd.

Herbert Morris, Ltd.—An extraordinary meeting was held at Loughborough on September 21st, at which a resolution was passed authorising the sub-division of each of the 400,000 issued and fully paid ordinary £1 shares into two ordinary shares of 10s.

J. & F. Stone Lighting & Radio has announced a final ordinary dividend of 7½ per cent., making 12½ per cent. for the year (against 10 per cent.).

The Midland Electric Corporation for Power Distribution is paying an interim dividend of 3 per cent. on the ordinary shares (unchanged).

The Telephone & General Trust, Ltd., has declared an interim dividend of 3 per cent., actual, less tax, at 4s. 7d., on the ordinary stock (same).

Hopkinsons, Ltd., are maintaining their interim dividend on the ordinary shares at 2½ per cent.

The Midland Counties Electric Supply Co., Ltd., is paying an interim ordinary dividend of 2½ per cent. (unchanged).

The Lancashire Electric Light & Power Co. is maintaining its interim dividend on the ordinary shares at 2½ per cent.

The International Automatic Telephone Co. is again paying an interim dividend of 3 per cent. on the ordinary stock.

The Hendon Electric Supply Co., Ltd., is maintaining its interim ordinary dividend at 2½ per cent., net.

Stocks and Shares

TUESDAY EVENING.

THE holiday season can now be regarded as definitely over. The majority of people are back in their accustomed places and the stage is set for the activity that the autumn is expected to bring. Having regard to the unusually animated conditions which prevailed during August, the difference in the aspect of Stock Exchange markets to-day, as compared with that of a month ago, is not particularly striking. But the appetite of the investor continues to be as sharp-set as ever, and investment stocks are steadily rising. Although hesitation has been shown in the market for electrical equipment and manufacturing companies' shares, the recovery in prices was rapid as soon as the selling came to an end. General Electrics went down to 89s. 6d., to recover within a day or two to 91s. 6d. Cromptons dropped to 79s. 6d. before rallying to 4½, and other such instances could be quoted to show the resiliency of prices that is due to the insistence of investment demand.

Fixed-interest Securities

Renewed strength in gilt-edged and other fixed-interest stocks is attributable partly to the raising of the Government-controlled price of Funding 2½ per cent. stock from 92¾ to 92½. This is now familiarly known as the "tap" price, being regulated by a special arrangement between the market and Government departments, whereby the latter are enabled to realise their investments in the stock at a "pegged" level. The latest adjustment is the second to be made this month, and the fourth since the arrangement began in June: on each occasion the price has been raised by ⅛. These negotiations, reflecting, as they do, an authoritative view of the course of interest rates, are naturally watched very closely.

Evidently the Government is having no difficulty in placing its holdings, and, in asking higher prices, assumes that there is little likelihood of a slackening in the demand. The inference is, of course, that monetary conditions will continue on their present easy lines, and that a reaction in the prices of fixed-interest securities is not, at present, anticipated. On this assumption the banks, and other big institutions which feel the weight of unemployed funds, are able to enter the market with revived confidence and a freer hand.

Electrical Equipment Shares

A spirit of caution is, at the moment, manifest in the market for electrical equipment shares. This receives witness from the reaction that has occurred in the prices of General Electric and similar shares from the high levels reached a fortnight

ago. There is no diminution of optimism so far as the long-term prospects of the industry are concerned. Leaving out the possibility of disturbing extraneous influences, it is generally held that demand for electrical equipment will continue to grow at a lively pace for some time. That the manufacturing companies will, under such conditions, enjoy a corresponding increase in their gross receipts, follows naturally. Doubt enters in only where net profits, and the amounts available for distribution in ordinary dividends, are concerned. Some of the companies in the group are thought to be already working at, or near, capacity; in such cases, increased output could be accomplished only by the extension of present accommodation and plant. There is an interesting analogy to be observed in the steel industry, where financial provision for expansion is, in some cases, affecting dividend considerations. It is possible, too, that the electrical industry may have to face increased costs in the form of wage-rates and of raw materials, including copper. It may be, then, that dividends on ordinary shares will be held back, to a certain extent, from the rapid rise which the recent high price level seemed to discount. The present reaction is taken as a healthy sign that optimism is not being allowed to outrun discretion.

Price Movements

Associated Electricals, at 52s., show a net loss of 1s. 6d. on the week, having touched 51s. 6d. Henleys and Callenders, in the cable equipment group, reacted half-a-crown each, and British Insulated fell 1s. 3d. Others to lose ground were English Electrics, Arons and Siemens, the last two mentioned being each ⅛ lower. Hall Telephones eased off to 23s. 6d. International Automatic Telephones are quoted ex-dividend at 48s. 9d. The latter company, which will shortly be known as Automatic Telephone and Electric, has announced an interim dividend at the same rate, 3 per cent., as last year's. Allen Wests, in falling from 8s. 3d. to 7s. 9d., lost some of their recent buoyancy. Among recently issued shares, the new General Electrics are 91s. 6d., Hall Telephones 24s., and Telephone Manufacturing 11s. 3d. Dealings started to-day, Tuesday, in the 5s. "A" ordinary and £1 5 per cent. preference shares of Laurence, Scott & Electromotors. The "A" shares were in popular demand at the opening price of 8s. 3d., the latter quickly improving to 10s. 3d. The preference shares, which stand at 21s., are the subject of unusual conditions, being redeemable, by yearly instalments, at 22s. Any shares outstanding in the year 2000 must be paid off at the same price.

Television

Scophony, Ltd., shares, of 5s. each, were introduced to the Stock Exchange last July, some fifteen months after the date of the company's incorporation. Their present price of about 8s. seems to reflect very fairly the degree of confidence with which the coming of television on a universally practicable basis is awaited. At this week's first general meeting no prophecy was hazarded as to when that day will arrive, but the chairman was sanguine that, in the long run, there would be no difficulty in meeting the conditions which he himself laid down for the successful development of commercial television.

Palestine Electric Corporation

A rally to 49s. 9d. in the price of Palestine Electric "A" shares reflects the steadying influence of Sir Herbert Samuel's speech at the annual meeting, held last week, and of the drafting of British troops to the scene of the disorders. The fact that Sir Herbert is himself a former High Commissioner of the mandated area adds weight to his reassuring view that the economic structure of the country has not been seriously damaged and to his confidence in the ability of the mandatory power to restore such order as to allow the continuance of peaceful progress. If a further sign of the Palestine Electric board's confidence were needed it lies in the decision to proceed with, and even augment, the plans laid down last year for the extension of power plant. One of the most striking points in Sir Herbert's speech was that the company's receipts in May, June and July of this year showed an increase of 12 per cent. over the corresponding months of 1935.

While the chairman's review of the company's progress since 1926 makes remarkable reading, it is evident that so long as the economic and industrial development of Palestine is allowed to proceed in a normal manner there will remain wide scope for further expansion. At their current price the company's "A" shares provide a yield of a few pence over 3 per cent., free of income tax, equivalent to 4 per cent., allowing for tax at 4s. 9d. in the pound.

Miscellaneous Matters

The August traffic index of Cable and Wireless gave a two-point increase over that of August, 1935, but this aroused no particular interest, and prices of the stocks remained unaltered. Marconi Marines at 35s. have regained the deduction of sixpence per share, the interim dividend. American utilities are steady as a whole, but American Telephones are down 3 points to 172½. The British iron and steel group is moderately active, with prices higher on balance. Rubber shares attract rather more attention, but there is no increase in general business. Speaking generally, the Stock Exchange markets are firm in tone and supplied with enough orders to keep members of the House fairly well employed.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Sept. 22.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/-	—	4 1 1
Clyde Valley	1	7	8	46/6	—	3 8 10
County of London	1	10½	10½	55/-	—	3 16 4
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord.	1	8	8	45/-	—	3 11 0
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3½xd	+9d.	4 0 0
Elec. Supply Corporation	1	11	11	60/9	—	3 12 4
Lancs Light and Power	1	7½	7½	38/-xd.	+6d.	3 19 0
Lond. Assoc. Electric	1	—	7	35/-	—	4 0 0
London Electric	1	7	8	39/6	—	4 1 1
London Power Deb. Red.	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	51/-	—	3 18 5
Midland Counties	1	7	7½	41/6xd.	+9d.	3 12 2
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	35/6	—	3 7 7
Do. 7% Pref.	1	7	7	36/-	—	3 17 9
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary	1	10	10	58/3	—	3 8 7
Do. do. 6% Pref.	1	6	6	32/6	—	3 13 10
Scottish Power	1	8	8	42/-xd.	—	3 16 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/-xd.	—	6 16 4
Yorkshire Elec.	1	8	8	44/-	—	3 12 9

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock		5	116½	—	4 5 9
Do. 1955–75	„	5	5	118½	—	4 4 4
Do. 1951–73	„	4½	4½	111½	—	4 0 9
Do. 1963–93	„	—	3½	104	—	3 7 4
London Elec. Trans. Gtd.	„	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A	„	—	4½	125½	+1	3 11 9
Do. do B	„	—	5	128½	—	3 17 10
Do. do C	„	3½	4	107	—	3 14 9
West Midlands Joint Elec. 1948–68	„	—	5	115½	—	4 6 7

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	172½	—3	5 4 4
Anglo-Am. Tel. Pref.	Stock	6	6	128½	—	4 13 5
Do. Def.	„	1½	1½	32	—	4 13 9
Cable & Wireless 5½% Pref.	„	4½	5½	101	—	5 9 0
Do. A. 7½% Ord.	„	Nil	Nil	20½	—	—
Do. B. Ord.	„	Nil	Nil	6	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14	—	3 4 4
Do. Do. Pref.	10	6	6	14½	—	4 4 3
Great Northern Tel.	10	20	20	47	—	4 5 0
Marconi-Marine	1	10	7½	35/-xd.	+6	4 5 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1525	—	—
Do. do. Pref. Ord.	„	8	8	175½	—	4 11 2
Brazil Traction	100	—	30 cts	12⅝	+⅛	—
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	104½	—	4 15 8
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	45	—	—
Victoria Falls Ord.	1	20	12	3⅛	—	3 3 0
West Riding	1	5	6½	50/-xd.	+9d.	2 12 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	63/9	—¼	4 14 1
Assoc. Elec. Ord.	1	6	8	52/0	—1/6	3 1 6
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	51/3	—	3 2 4
British Aluminium Ord.	1	7½	7½	41/6	—1/-	3 12 2
British Insulated Ord.	1	15	20	5½xd.	—¼	3 12 9
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	4½	—½	3 6 8
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	4½	+¼	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	3½	7	40/-	—	3 10 0
Enfield Cable Ord.	1	25	25	5½	—	4 7 0
English Electric	1	Nil	Nil	27/-	—3d.	—
Do. Do. Pref.	1	Nil.	Nil	27/6	—	—
Ericsson Tel.	5/-	24	20*	2⅛	—	1 17 3
Ever Ready	5/-	35	35	26/6	—	6 12 0
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/-	—	3 14 4
Do. Ord.	1	10	15	91/6	—	3 5 6
Henleys	1	30	30	7½	—½	4 1 4
Do. 4½% Pref.	5	4½	4½	5½	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	54/3	—	3 13 9
Lancashire Dynamo	1	8	10	3	—	3 6 8
Siemens Ord.	1	4	6	32/6	—¼	3 13 10
Telegraph Construction	£1	Nil	Nil	33/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

33882. "Cathode-ray tubes." Radio Akt.-Ges. D. S. Loewe. November 27th, 1933. (452650.)

33979. "Radio direction-finders." G. G. Kruesi. November 25th, 1933. (452651.)

34114. "Automatic telephonic alarm." R. W. Mackenzie. November 27th, 1934. (452711.)

35102. "Cables suitable for the transmission of high-frequency electric currents." A. D. Blumlein and E. C. Cork. December 6th, 1934. (452713.)

1935

2349. "Television receiver." Radio Akt.-Ges. D. S. Loewe. January 25th, 1934. (Addition to 445428.) (452715.)

2423. "Motor and driving-wheel arrangements for electrically driven vehicles." W. J. Tennant (Tatra Works, Ltd.). January 24th, 1935. (452509.)

2494. "Telephone receivers." E. Hausdorf. February 2nd, 1934. (452572.)

2540. "Electric condensers." Porzellanfabrik Kahla. January 26th, 1934. (452573.)

2542. "Insulating material." H. Vogt. January 25th, 1934. (Cognate applications 2543/35, 2544/35 and 2545/35.) (452768.)

5868. "High-tension electric transformers." W. M. Burden, V. E. Pullin and L. G. H. Sarsfield. February 23rd, 1935. (452717.)

5893. "Carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., and W. T. Ditcham. February 25th, 1935. (452582.)

5994. "Electron-discharge device oscillators." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. February 25th, 1935. (452583.)

6010. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. February 23rd, 1934. (452585.)

6012. "Telephone systems." Standard Telephones and Cables, Ltd., and A. M. Searle. February 25th, 1935. (452586.)

6037. "Cathode-ray tubes." F. H. Nicoll and Electric and Musical Industries, Ltd. February 25th, 1935. (Addition to 431327.) (452589.)

6038. "Cables suitable for the transmission of high-frequency electric currents." A. D. Blumlein and E. C. Cork. February 25th, 1935. (452772.)

6161. "Magnetos." British Thomson-Houston Co., Ltd., L. Griffiths and S. H. Franklin. February 26th, 1935. (452657.)

6196. "Electro-medical apparatus." F. Mealy and L. Stoves. February 27th, 1935. (452775.)

6308. "Electric cables for the transmission of wide frequency bands." Standard Telephones and Cables, Ltd., W. K. Weston, D. Nunn and M. C. Field. February 27th, 1935. (452779.)

6397. "Electron-discharge device circuit arrangement." Marconi's Wireless Telegraph Co., Ltd. February 28th, 1934. (452790.)

6403. "Directional wireless aerial systems." A. D. Blumlein. February 28th, 1935. (452791.)

6448. "Electric welding machines." H. G. Watkin. March 1st, 1935. (452729.)

6454. "Momentary-contact electric switches." J. Benson. March 1st, 1935. (452517.)

6542. "Television receiving systems." A. C. Cossor, Ltd., L. H. Bedford and W. H. Stevens. March 1st, 1935. (452730.)

6832. "Method of and apparatus for measuring the phase angle between two alternating current magnitudes, more especially for remote measurement purposes." Landis and Gyr Akt.-Ges. April 20th, 1934. (452849.)

7059. "Electrically heated boiling-plates or the like." Simplex Electric Co., Ltd., and P. W. Davis. March 6th, 1935. (452800.)

7069. "Electric motors." Kingsway Electricals, Ltd., and G. Osmond. March 6th, 1935. (452668.)

8300. "Electric fuse switches." V. Hope. March 18th, 1935. (452518.)

8875. "Recording of sound or like oscillations on a carrier." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 26th, 1934. (452803.)

10150. "Electric-arc welding." H. M. Henderson. April 1st, 1935. (452670.)

10433. "Electro-magnetically operated electric switches." G. E. Crabtree, W. T. Elliott, E. Badham, and R. W. Thornton. (Legal representatives of J. A. Crabtree, dec.). (Schiele & Bruchsaler Industriewerke Akt.-Ges.). April 4th, 1935. (452598.)

10937. "Electric generators for bicycles." C. Pauls. April 9th, 1935. (435522.)

11441. "Electrical apparatus for permanently waving the hair." F. H. Rogers (F. Ströher Akt.-Ges.). April 12th, 1935. (452600.)

11699. "Lighting systems." P. E. Nobbs. April 16th, 1935. (452807.)

14294. "Electric battery lamps." W. J. Hill. May 16th, 1935. (452601.)

18183. "Carriers for attaching overhead electric power cables to insulators." Bullers, Ltd., and H. C. R. Dagnall. June 25th, 1935. (452678.)

18321. "Arc-extinguishing means in electric circuit-breakers." Siemens-Schuckertwerke Akt.-Ges. August 31st, 1934. (452813.)

21193. "Electrically heated central-heating installations." W. Von Sauer. July 25th, 1934. (452816.)

26569. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 12th, 1934. (452541.)

31406. "Electric switches with luminous indicators." Aktiebolaget Hg. Relay Patent. November 30th, 1934. (452619.)

31680. "Electro-magnets." Creed & Co., Ltd. February 23rd, 1935. (452691.)

32273. "Arrangement for maintaining creep speeds in a.c. motors of the induction type." J. Bentley and H. L. Galloway. February 25th, 1935. (Divided out of 6701/34.) (452621.)

32436. "Circuit arrangements for supplying electric-discharge devices." Siemens-Schuckertwerke Akt.-Ges. December 1st, 1934. (452824.)

33001. "Manufacture of spark-plugs." General Motors Corporation. December 3rd, 1934. (452623.)

33652. "Fluorescent layers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 4th, 1935. (452747.)

33886. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 11th, 1935. (452749.)

34989. "Fluid-blast circuit-breakers." Allmanna Svenska Elektriska Aktiebolaget. December 17th, 1934. (452751.)

36026. "Quick-break electric switches." V. Hope. December 31st, 1935. (452554.)

1936

308. "Electric circuit-breakers." British Thomson-Houston Co., Ltd. January 3rd, 1935. (452752.)

910. "Cam-operated electric switches." Porzellanfabrik Kahla. February 6th, 1935. (452753.)

2593. "Thermostatically controlled electrically heated irons." N. F. T. Saunders, N. Barnes, and F. J. Mudge. March 19th, 1935. (Divided out of 8605/35.) (Cognate application 22085/35.) (452562.)

7258. "Electric irons." R. G. Boardman. March 26th, 1935. (452569.)

8255. "Production of long lengths of metal-jacketed electric cables." Siemens-Schuckertwerke Akt.-Ges. March 30th, 1935. (452703.)

8822. "Electron valves." Naamlooze Vennootschap Machinerieen-En Apparaten Fabrieken Meaf. March 1st, 1934. (Divided out of 6415/35.) (452761.)

8823. "Air-space insulated high-frequency electric cables." Siemens & Halske Akt.-Ges. April 3rd, 1935. (452704.)

9366. "Connections for electric heating elements." T. Stiebel. March 30th, 1936. (452705.)

10785. "Method of charging electric lead accumulators having slight local actions." Compagnie Générale d'Electricité. April 15th, 1935. (452842.)

14079. "Electric welding." British Thomson-Houston Co., Ltd. May 21st, 1935. (452707.)

18970. "Cathode-ray tubes." Radio Akt.-Ges. D. S. Loewe. November 27th, 1933. (Divided out of 452650.) (452844.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 16th :—

Maestro. No. 568794. Class 8. Electric batteries and accumulators (not for medical purposes).—R. G. W. Brown & Co., Ltd., 11-13, Princess Street, Dundee.

Dynolamp. No. 567240. Class 13. Lamps for vehicles.—H. Miller & Co., Ltd., Monarch Works, Aston Brook Street, Birmingham.

Photoflux. No. 566162. Class 13. Electric lamps (ordinary). —Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Claudgen. No. 569411. Class 15. Glass for use as parts of electric discharge lamps and as parts of signs.—Claude-General Neon Lights, Ltd., Pitman House, Parker Street, Kingsway, W.C.2.

Zolate. No. 570610. Class 50. Insulating substances of asbestos, vermiculite, mica, resins, oils, magnesia and bitumen.—British Zonolite Products, Ltd., Orchard House, 30, Orchard Street, W.1.

Extensions at Dublin

WHEN water from the River Liffey was allowed to flow into the new pump house this week another step was taken in the extension of the Pigeon House generating station at Dublin. The capacity is to be raised from 45,000 kW to 65,000 kW as an auxiliary to the Free State water power plant at Ardnacrusha. It has been necessary to erect a completely new building as an addition to the station to house twelve pumps, four of which are already erected, with much switchgear and, high up in the roof, a circular control room. The erection of the last two of five new boilers will soon be finished. The cooling water scheme was prepared by the Pioneer Road Construction Co., working in co-operation with a German firm, Messrs. Wayss & Freytag, and embraces the construction of an intake, pump-house and culvert in reinforced concrete.

Two tunnels, each 6 ft. in diameter, encased in concrete, extend 600 ft. into the river, to the concrete intake which is crowned by a navigation light just above the level of the water at high tide. The building of the intake and the sinking and joining up of the caissons, each about 100 ft. long, involved the continuous use of air compression chambers, enabling the men to excavate the bed of the river underneath the culvert and drop it to the required level.

The sump, 40 ft. wide and 110 ft. long, into which the water will flow from the culverts, and thence through twelve sluice gates to be screened before it enters the pumping chambers, was built (not sunk) to a depth of over 35 ft. on the same principle. A 10 ft. high reinforced concrete wall in casing, formed on the caisson style with a concave bottom, was first built on the ground level and allowed to set. Then the earth was excavated from beneath and the wall allowed to subside 8-9 ft. into the ground. Another 10 ft. was added to it in ground level, and a proportionate quantity of earth removed below, allowing it to drop a further 8-9 ft., and so on, until a depth of 35 ft. was reached. Each section of the sump (the four walls built to a height of 10 ft.) weighed 2,500 tons.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnsley.—Houses (48), Northgate, for W. Healey.

Bingley (YORKSHIRE).—Extensions to works; Joseph Steele & Sons, Ltd.

Birmingham.—Extensions to works, for The Brooke Tool Manufacturing Co., Ltd., Greet. Extensions; Hordern, Mason & Edwards, Ltd., Pype Hayes.

Blackwell (NOTTINGHAMSHIRE).—Houses (34), Pinxton; A. H. Elliott, Gilcroft Chambers, Church Lane, Mansfield.

Bournemouth.—Factory, near Ringwood Road; A. J. Seal & Partners. Factory and offices, for the British Incorrodible Metal Co., Ltd.

Bradford.—Extensions; Busby (Bradford), Ltd., Manningham Lane; Chippendale & Edmondson, architects, 1a, Hustlergate.

Brighton.—Houses (60), Dale Crescent, Patcham; W. H. Clark. Institution for St. Dunstan's, Greenways, Ovingdean; Sir John Burnet Tait & Lorne, architects. Town hall (£125,000); J. L. Denman, architect. Extensions to Brighton Girls' Orphanage, Bristol Gate; Governors. Junior school, Woodingdean, and rebuilding School of Art (£163,430), for E.C.

Bristol.—Cinema at the corner of Union and Nelson streets, for the Odeon Theatres, Ltd.

Corpach (INVERNESS).—Factory, for the British Oxygen Co.

Coventry.—Factory, for Coventry Radiator & Press Work Co., Canley; J. G. Gray, builders, Broad Street, Coventry. Rebuilding the Coventry Hippodrome, Hales Street; Hattrell & Wortley, architects, 1, Queen's Road.

Crook.—Houses (124), Roddymoor, for the North-Eastern Housing Association, Newcastle-on-Tyne; G. R. Smith and Partners, architects, 3, Winchester Street, South Shields.

Danbury (ESSEX).—Church, for the Congregational trustees; F. Lawrence, architect, Bournemouth.

Darlington.—Cinema (£48,000), electrical work, for Councillor T. H. Pailor.

Darwen.—Extensions to the Avondale Road Senior Girls' school; E. Marsden, borough engineer, Town Hall.

Derby.—Girls' secondary school, Normanton, for Borough E.C.; C. H. Aslin, borough architect, Gower Street.

Dudley.—Houses (250), Rosland estate, bus station and market hall, and works depôt, Lister Road; borough engineer. Fourteen shops, Woodside estate (£13,677); Jakeman & Round. School, for Borough E.C.; Cooke & Twist, architects, Sun Buildings, Bennett's Hill, Birmingham. Extensions to works, Blowers Green; I. Emms & Sons, Ltd. Extensions to factory, Cradley Road; Lloyds British Testing Co., Ltd. Extensions to works, Halesowen Road; Dudley Iron & Steel Co., Ltd.

Durham.—Houses, Ludworth, Ushaw Moor, and Shincliffe; housing architect, Byland Lodge, Durham.

Ennerdale (CUMBERLAND).—Houses (180); R.D.C. surveyor, Cleator Moor.

Epping.—Two factories, for L. Nidditch, of the Gilda Investment Co.

Exeter.—Civic buildings; Bradshaw, Gass & Hope, architects. Extensions to Devon and Exeter Hospital; governors.

Failsworth.—Houses (70); U.D.C. surveyor.

Gateshead-on-Tyne.—Houses (204), Wrekenton; F. H. Patterson, borough engineer. Cinema between Macadam Street and Telford Street; Stanton, Atkinson and Bird, solicitors for the promoters, 46, Grainger Street, Newcastle-on-Tyne. Printing works, South Shore Road, for the Northumberland Press, Ltd.; Marshall & Tweedy, architects, 129, Pilgrim Street, Newcastle-on-Tyne. Extensions to Bretts Oil and Grease works, Pipewellgate; J. N. Fatkin, architect, 17, Bigg Market, Newcastle-on-Tyne.

Glasgow.—Bank, Callowgate; Commercial Bank of Scotland, Ltd. Church, Frankfield Street; Church of Scotland. Fire station, Mingarry Street (£70,000); city engineer. Factory and workshop, 17, North Wallace Street, for R. G. Lawrie, Ltd.; J. W. MacDonald, architect, 114, Nether Auldhouse Road. Store, Bardowie Street; A. M. Hamilton & Co., Ltd. Alterations to Astoria Cinema, Possil Road; Astoria Cinema, Ltd. Additions for William Beardmore & Co., Parkhead works; the manager. Extensions to Anderson College of Medicine, Dumbarton Road, and extensions to Ear, Nose and Throat Hospital; governors.

Great Yarmouth.—Police and fire stations; F. R. B. Haward, architect.

Hanley (STAFFORDSHIRE).—Extensions to premises, Stafford Street and Trinity Street, for Bratt & Dyke; George Ellis & Sons, builders, High Street.

Hastings.—Houses (36), near Hollington Old Lane, for Hollington Estates, Ltd.

Hebburn-on-Tyne.—Additions to the New Town works, A. Reyrolle & Co., Ltd.; Cackett, Burns Dick and McKellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Hertfordshire.—School, Durrants estate, Croxley Green; director of education, Hertford. School, Mays Lane, Barnet; county surveyor, Hatfield.

Hove.—Church, Hangleton, for Sussex Congregational Union; Rev. S. I. Blomfield.

Huddersfield.—Houses (180), Deighton-Sheepridge estate; borough engineer. Cinema (£45,000), electrical work; British Projects, Ltd., builders, 32, Great Windmill Street, London, W.1, and Portsmouth.

Ipswich.—Houses (50), Felixstowe Road (£19,038); borough engineer. Factory for the British Bleriot Aircraft, Ltd.

Irish Free State.—(DUBLIN).—Flat dwellings and shops, Townsend Street; H. G. Simms, housing architect, 3, Parliament Street.

Kettering.—Houses, Pytchley Road; Kettering Co-operative Society, Ltd. Shops and flats, Linden Avenue; F. G. Barlow (Properties), Ltd.

Lanchester.—Houses (180), Quebec area; R.D.C. surveyor.

Leigh-on-Sea (ESSEX).—Cinema, London Road and Blenheim Crescent (electrical work); F. L. Buckley, architect, 9, Dale Road.

Lewes.—Houses (8); C. T. Butler, borough surveyor.

Liverpool.—Administrative buildings, Speke aerodrome (£11,066); city engineer.

London.—(BERMONDSEY).—Civic centre with baths, clinic and library, Rotherhithe Street (£62,106); borough engineer. Extensions to factory, Macks Road; Griffiths Bros., Ltd., 29, Macks Road, S.E.16. (CATFORD).—Houses (60), Verdant Lane; Wates (Streatham), Ltd. (EAST HAM).—Houses (200), Bonny Downs estate, &c. (£133,000); borough engineer. Rebuilding, Boleyn Cinema, Barking Road; C. Masey, 15, Caroline Street, W.C.1. (HACKNEY).—Dwellings, Cazenove Street (£38,427); M. J. Gleeson, Ltd. (LEWISHAM).—Development of Beckenham Lane estate; L. A. Culliford, 58, Theobald's Road, W.C.1. Factory, Perry Vale; G. T. Harman, 90a, High Street, S.E.19. (ROTHERHITHE).—Factory, Rotherhithe New Road; W. Harbrow, Ltd., 214, Rotherhithe New Road, S.E.16. Shops and flats, 89-91, Jamaica Road; Heath Estates, Ltd. (SOUTH KENSINGTON).—Offices and showrooms, for the Kensington and Knightsbridge Electric Lighting Co., Ltd., Pelham Street, S.W.7. (HAMMERSMITH).—Showrooms and stores, Brook Green Road; Percy Pratt & Blount, 174, High Street, W.3. Stores, King Street; F. W. Woolworth & Co., Ltd. Extensions to depôt, Bulwer Street; London Passenger Transport Board, 55, Broadway, Westminster, S.W.1. (ST. PANCRAS).—Tenements, Carlow Street (£34,918); M. J. Gleeson, Ltd. Rebuilding premises of Aerated Bread Co., Ltd., Kentish Town Road; Sir Alexander Gibb & Partners, Queen Anne's Lodge, S.W.1.

Luton (BEDFORDSHIRE).—Cinema, George Street, for the Associated Cinema Properties, Ltd.

Manchester.—Junior school, for the Catholic Authorities of S.S. Thomas and John, Wythenshawe; Tinker & Young, Ltd., builders, Monsall Street, Miles Platting.

Middlesbrough.—Rebuilding of the Fleetham Street elementary school for E.C.; education architect, Woodlands Road.

Newburn-on-Tyne.—Branch premises for the Throckley Co-operative Society.

Newcastle-on-Tyne.—Houses (335), Pottery Bank estate for C.C.; G. Bailey, Ltd., builders, King Street, South Shields. Extensions to Town Hall for C.C.; city architect, 18, Cloth Market.

Newmarket.—Houses (40); R.D.C. surveyor.

Norfolk.—Central isolation hospital, East Dereham, for C.C.; county architect, 23, Thorpe Road, Norwich.

Northumberland.—Senior school, Mitford Road, Morpeth, for County E.C.

Northwich.—Cinema for D. Forrester, Manchester (£30,000).

Nottingham.—Factory, for John Player & Sons, Ltd.

Nuneaton.—Cinema, Abbey Street, for the Union Cinema Co., Ltd.; G. E. & W. Wincott, builders, 64, Coton Road.

Portland.—Houses, Tilleycombe; U.D.C. surveyor.

Portsmouth.—Church, for the Baptist trustees; John Hunt, Ltd., builders.

Renfrew.—Houses (38), Paisley Road; J. Lawrence & Co., Ltd., 50, Wellington Street, Glasgow.

Ripon.—Cinema (1,000 seats); Pennington, Hustler & Taylor, architect, Pontefract.

Rochdale.—Alterations and additions to buildings, Birch Hill Institution, for the Public Health Committee; Lear & Heywood, Ltd., builders, Law Street, Castleton.

Saltcoats (AYRSHIRE).—Houses (164); burgh surveyor.

Sheffield.—Enlargement of the Cathedral (£20,000); Cathedral Council.

Sheldon.—Block of ten shops and flats, Coventry Road, for Blakemore & Winterton, 43, Cannon Street, Birmingham; Enterprize Buildings, Ltd., builders, Birmingham.

Somerset.—Police buildings (£19,112); county architect.

Southend-on-Sea. — Extensions to municipal hospital (£272,745); borough engineer.

South Shields.—Houses (600), Little Horsley Hill estate; J. Reid, borough engineer.

Stanley (Co. DURHAM).—Houses, Ledger Lane; U.D.C. surveyor.

Stockton-on-Tees.—Houses, near Oxbridge Avenue; G. Hope, builder, "Montrose," Hartburn Avenue. Extension to offices, Beaumont Street, for Pickerings, Ltd.; staff architect.

Stranraer.—Houses (100), Dick's Hill; J. Mercer, burgh surveyor, Municipal Buildings.

Sunderland.—Institution for the Sunderland and Durham Institution for the Blind (£50,000); W. and T. R. Milburn, architects, 17, Fawcett Street. Rebuilding and extension to works after fire for I. Griew & Co.; Randle & Co., builders, Bank, Dunelm Street.

Sussex.—Senior school, Seaford, for County E.C.; county architect, Chichester. Extensions to Lewes Boys' Secondary school; E. A. Verger, East Sussex county architect, Lewes.

Tynemouth.—Houses (152), Ridges estate (£39,696); S. Pye, South Shields.

Warrington.—Houses (34), Capesthorne Road; Tomlinson & Norbury. Houses (66), Nook Lane; Curbishley Bros. Premises, Horsemarket Street; Montague Burton, Ltd. Extensions to works, Howley; J. Chadwick & Sons, Ltd. Rebuilding factory, Norman Street; Alliance Box Co., Ltd.

Watford.—Houses (120); W. W. Newman, borough engineer.

Wigton (CUMBERLAND).—Houses (98); housing architect.

Yeovil.—Houses (260), Preston Park estate, for Lucas Bros.